Famous Photographers Course

Famous Photographers Course
Famous Photographers School, Inc., Westport, Connecticut

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Index

The darker or boldface numbers in this Index are lesson numbers; the lighter numbers are page numbers. Thus, for example, the numbers **20**:18 next to a subject indicate that information on that subject may be found in Lesson 20, on page 18. The abbreviation **Intro** means the Introduction to the Study Guide.

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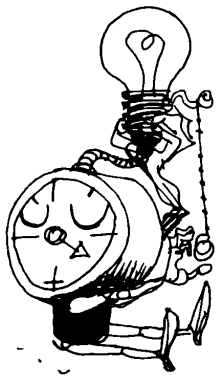

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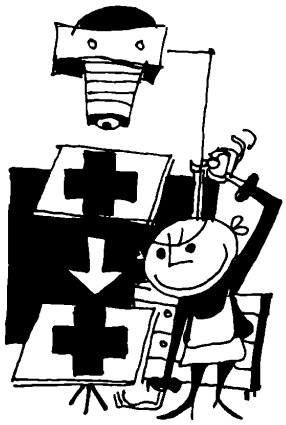

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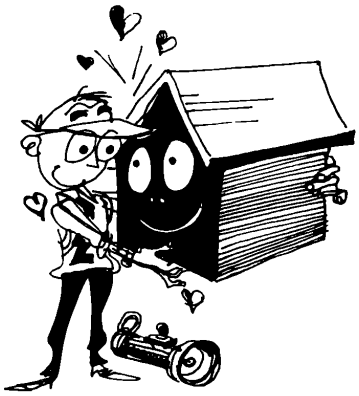

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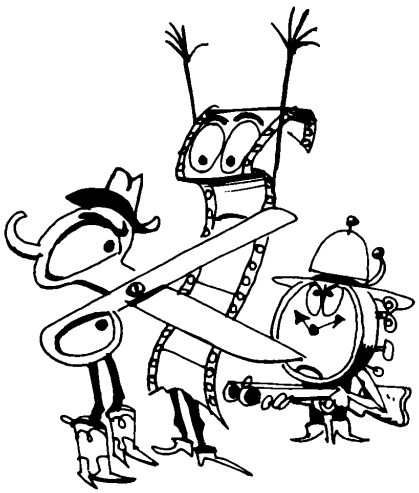

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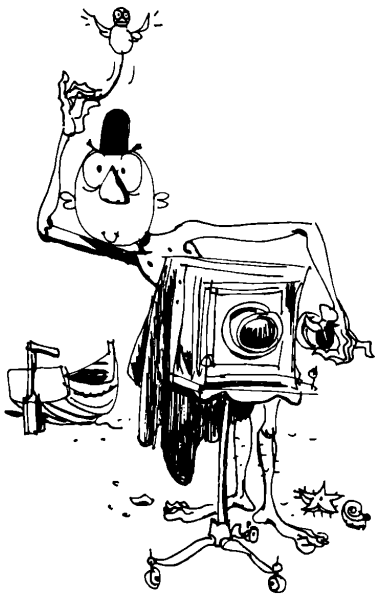

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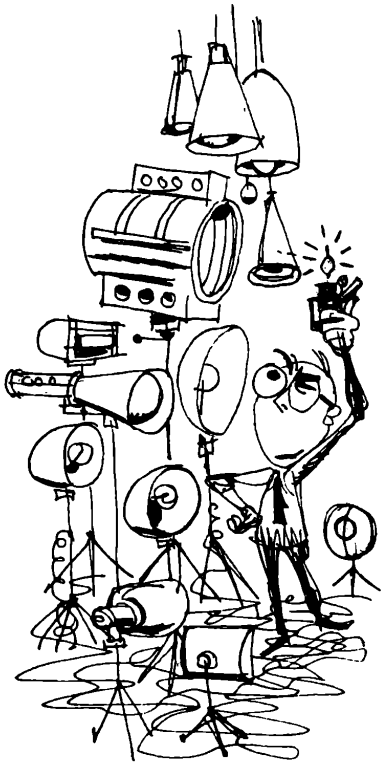

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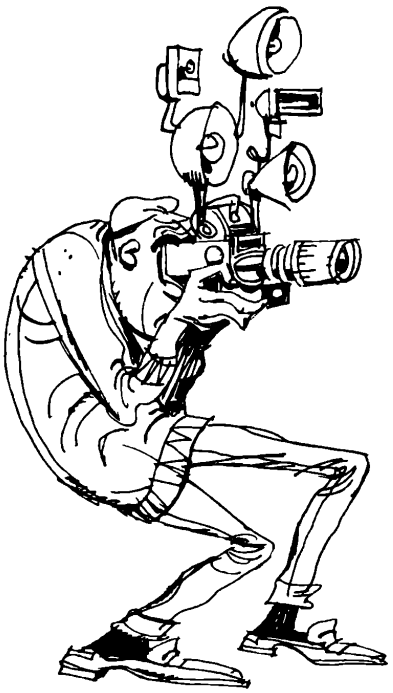

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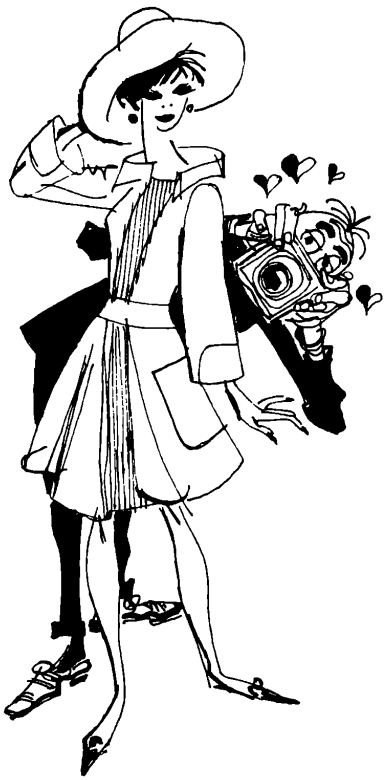

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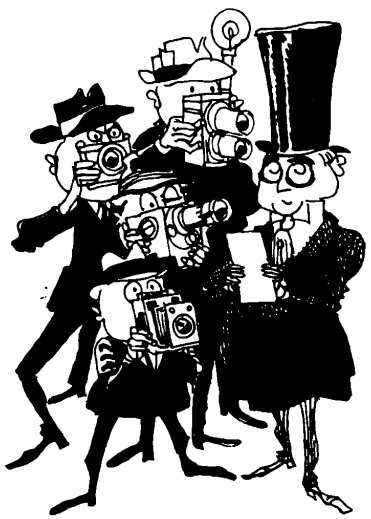

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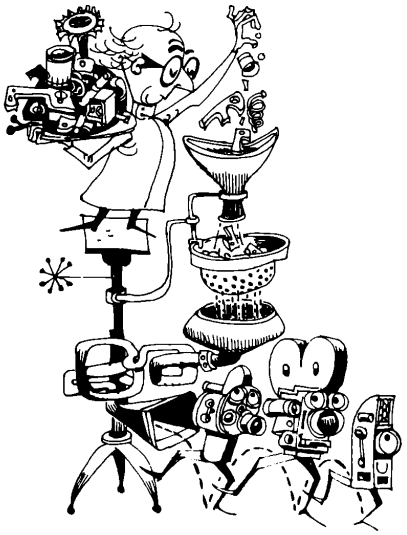

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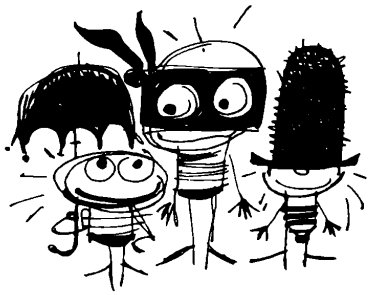

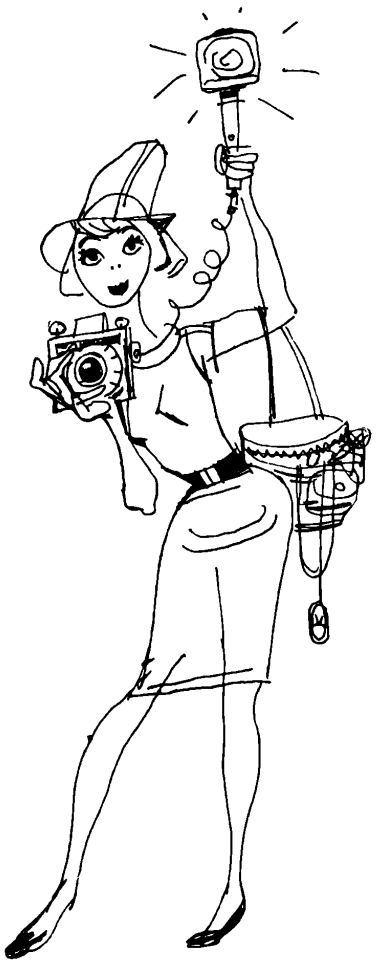

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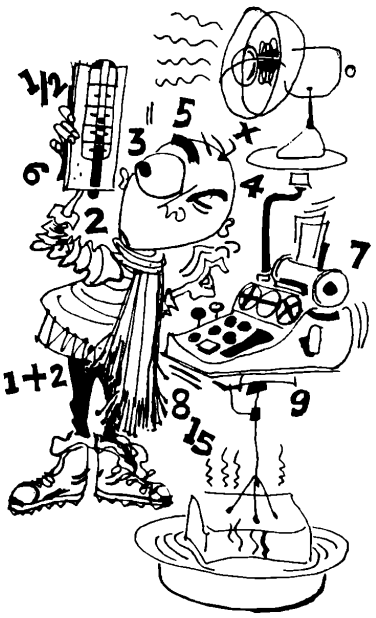

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Famous Photographers Course
Famous Photographers School, Inc., Westport, Connecticut

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Lesson

2

Your camera and how it works

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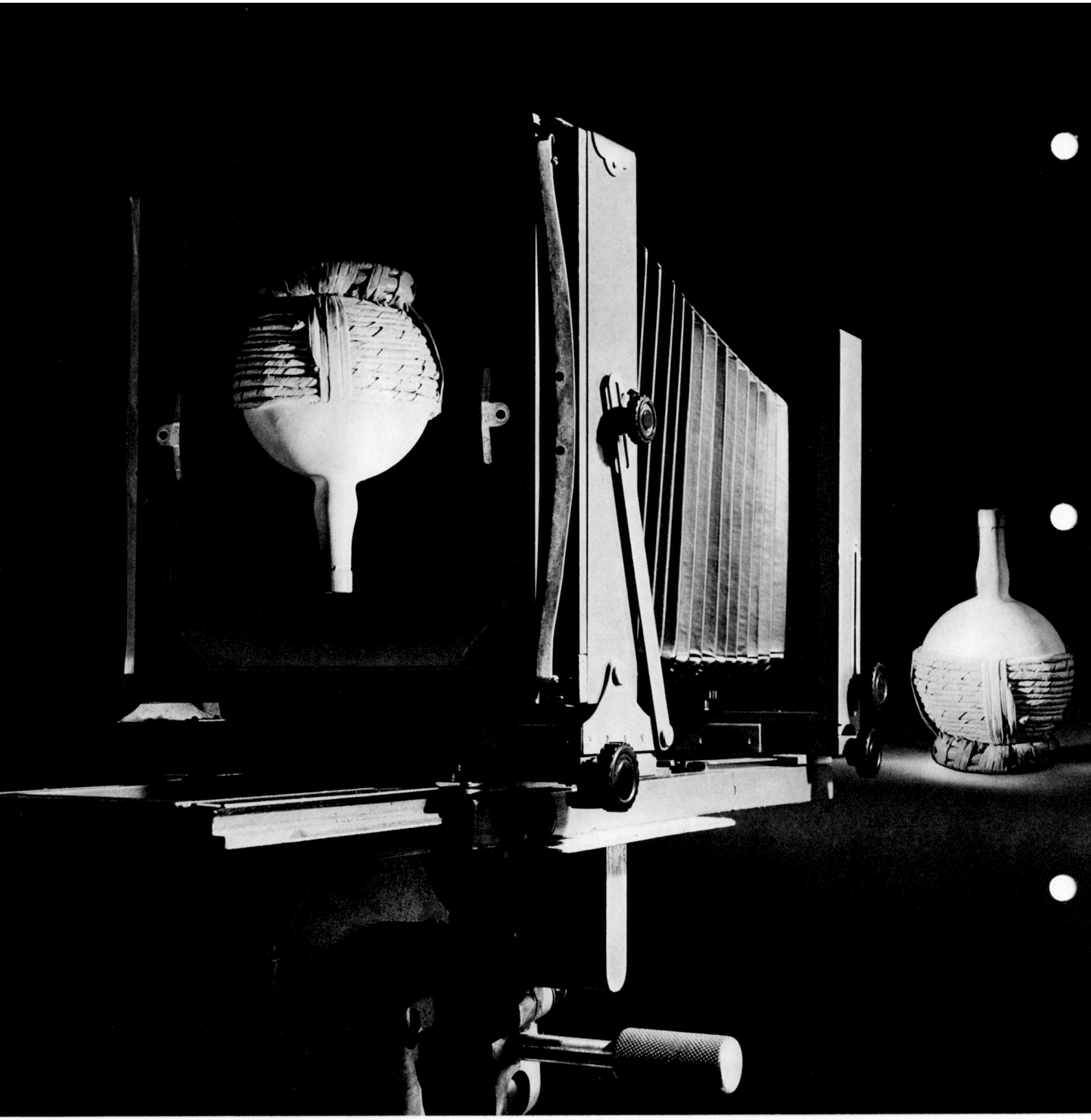


A camera can instantaneously record a scene, object, or person in exact detail. The camera's lens gathers rays of light from the things in front of it and focuses them to form an image. [In the photograph above, the image of the bottle is clearly visible upside down on the groundglass back of a studio view camera.] Film can capture this image and give you a permanent visual record.

By applying the principles you will learn in this lesson, you'll be able to use your camera in a more imaginative, effective way. You'll learn how to handle the camera's various parts and controls to get clear, sharp, well-exposed pictures and create many exciting visual effects.

The camera and creative photography

The camera is one of the most amazing devices ever invented. In the flicker of an eyelash it can record a vast landscape with its multitude of detail and subtle play of sunlight and shadow. It can clearly show the intricate mechanism of a tiny watch, the ornate carving of a giant cathedral, the lines and texture of a human face. Nothing is too small, too large, or too finely detailed for the camera's exact eye.

The camera is master of time. It can catch a fleeting moment and preserve it for generations to come. A child's first halting steps; a face suddenly illuminated with love, joy, fear, hate, or surprise; the instant of impact when a bullet shatters a pane of glass; a sunset; an event trivial or momentous–a camera can capture all of these and much more. Out of the ceaseless flow of time, it can pluck the moments that you, the photographer, feel are the most meaningful and revealing, and save them to share with others.

Your camera is a faithful servant that can do these wonderful things for you–if you understand how it works, and can handle its controls with speed and dexterity. Therefore, you'll want to learn all about your camera, to know it thoroughly from top to bottom, to master its full potential for creating visual effects.

In this lesson we'll begin with an overall look at the anatomy of a typical camera–the important parts that are common to most types, large and small, simple and advanced. Then we'll demonstrate how to use the three important camera controls–focusing, aperture, and shutter speed–so you can produce pictures that both are technically good and express your feelings about the subject in a vivid, interesting way. You'll see how the lens opening can be used to control the range of sharpness in your pictures, and how different shutter speeds can "freeze" motion or show it as streaks and blurs. And you'll be taught how to make shutter speed and lens opening work together to regulate the amount of light reaching the film.

If you are a relatively inexperienced photographer, the information and practice exercises given here will provide the solid basis for your future growth. You'll acquire skills you can put to work immediately to improve your pictures and continue to use throughout this Course.

Some of the ground covered may already be familiar to you. Even if this is so, we urge you to study this lesson with care. For one thing, it will refresh your memory and reinforce things you already know. It will touch on points you may have missed or forgotten. And it will enlarge and enrich your understanding of how to take a good picture.

What camera do you need?

Any well-made camera with fully adjustable controls [focus, lens opening, and shutter speed] and a lens that will give you a sharp picture is adequate for this Course. We don't recommend a simple "box-type" camera because it lacks the adjustments necessary for the sensitive, flexible picture control you need for creative photography.

It may reassure you to know that most of your Faculty members started in photography with cameras inferior to even modestly priced equipment available today. For example, Ezra Stoller began with a used 4x5 camera he bought for $5, Harry Garfield with a folding Brownie, and Alfred Eisenstaedt with an inexpensive roll-film camera. They were able to do good work with limited means because they learned to see creatively, and to squeeze the utmost performance from their cameras.

Of course, as they enlarged the scope of their shooting and began to work on professional assignments, they acquired better, more versatile equipment–and so may you. As a professional whose career depends on results, you'll want the best equipment you can afford. Also, you'll find that some kinds of pictures call for special lenses, cameras, or accessories.

But go slowly. Thoroughly master what you have before replacing it or adding to it. [As we go along, we'll point out the important accessories that can make your camera even more versatile.] Right now, concentrate on learning the *fundamentals of photography*, using the best equipment you can afford. And the chances are, the camera you presently own is good enough. In fact, in the course of this lesson, you may learn that it has exciting capabilities you've never before put to work.

Vision and technique

In the previous lesson, we emphasized creative vision–your ability to *see* things from a unique, personal viewpoint. Creative *vision* and photographic *technique* are two sides of the same coin. Of course, technical skill alone isn't enough. But without adequate technical skill, even the most imaginative photographer can't express himself with fullest freedom and control. You need to cultivate both vision and technique to grow as a photographer.

The ability to handle your camera with speed, ease, and precision is an important part of photographic technique. Make it a goal to achieve this skill just as quickly as you can. Then, instead of fumbling and fussing with mechanical manipulations, you'll be free to concentrate full attention where it belongs–on creating good pictures!

Reading this lesson carefully will help you better understand your camera and its potentialities. But reading isn't enough. You'll need to apply what you've studied by doing all the exercises and assignments. But go even beyond that–practice loading, holding, aiming and shooting your camera; practice handling its controls; discover the effect of different lens openings and shutter speeds until all this becomes as unconscious and automatic as shifting the gears of a car or typing by the touch method. Always remember: *The only way to learn photography is by taking pictures!*

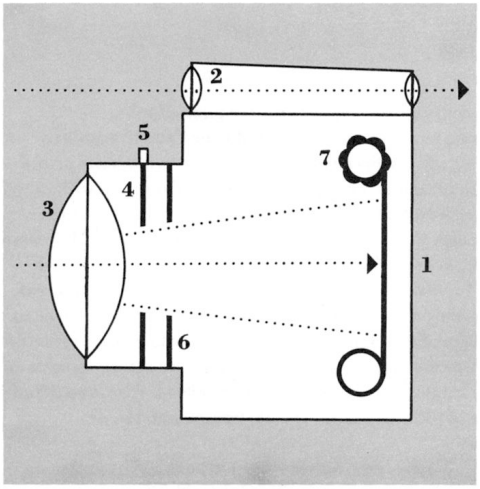
The basic parts of a camera

Know your camera! This is one of photography's most important commandments. Every successful photographer is the master of his camera. He knows what it can do, and he can control it not only to make a picture of high technical quality but also one which creatively expresses his thoughts and feelings about the subject.

Your first step in becoming a good photographer is to understand how your camera works, and how to control it.

Cameras vary in two basic ways–the size of film they take and the type of viewfinding system or systems they use. They may also differ in a variety of other details of design and construction. But from the simplest box camera to the most elaborate professional model, most cameras consist of the basic parts shown in the diagram below.

You can get more from this lesson if you study it with your camera near at hand. As we mention the various parts and controls in the text, locate them on your own camera, and make sure you thoroughly understand them. Of course, different camera types, makes, and models differ in the features they include, and in the location and operation of these features. For detailed information about *your* equipment, read the instruction booklet provided by the manufacturer. If you've read it already, *read it again.*



This diagram shows the basic parts that are common to most types of cameras for still photography.

1 Lightproof box

Reduced to its simplest elements, this box has an opening to admit light at one end and a means for holding film at the other. The size and shape of the box vary with different camera types, but its purpose is the same. It shields your film so that unwanted light doesn't fall on it, and it holds the mechanical and optical parts of the camera.

2 Viewfinder

Your viewfinder shows you what you'll get in your photograph. It helps you aim the camera and compose the picture. You use some viewfinders at eye level, and others you look down into with your camera held at waist level. Viewfinders can vary all the way from a simple open frame of wire to a complicated optical system involving mirrors or prisms.

3 Lens

The camera lens is an optical device that gathers rays of light from the things in front of it and focuses them to form an image on a light-sensitive surface. The simplest type of lens is a single slab of glass or transparent plastic with curved surfaces. More complicated lenses include two or more separate pieces of glass, called *lens elements*, which are mounted as a unit. In the simplest cameras the focus is fixed. Objects beyond a minimum distance of a few feet are recorded in reasonably sharp focus. Adjustable cameras provide a *focusing control* which allows you to focus exactly on objects at different distances in order to record them sharply.

4 Shutter

The shutter is a mechanical device inside the camera that controls the length of time the image is allowed to fall on the film. The shutter of a typical simple camera is set to open and close at relatively slow speeds–often in about 1/50 second. Adjustable cameras offer a choice of different shutter speeds.

5 Shutter release

The shutter release is a push button or lever which trips the shutter, thus letting light fall on the film.

6 Iris diaphragm

This is a device, found on adjustable cameras, for varying the size of the lens opening to admit more or less light as you wish. Usually it's located between the lens elements. Thin leaves of metal are arranged to overlap in an ingenious way to produce a circular opening of continuously variable size. [Incidentally, the symbol of the Famous Photographers School is a simplified, front-on view of an iris diaphragm.]

Don't confuse the iris diaphragm with the shutter, even though on some cameras they may be mounted close together and look somewhat alike. They perform two distinctly different tasks. When the shutter is closed, *no* light gets into the camera. But when the shutter opens to let you take a picture, light must pass through the opening in the iris diaphragm. By controlling the size of this opening, or *aperture*, as it's also called, you can regulate the amount of light that enters the camera–the larger the hole, the more light you let in.

Another point that might be confusing, if you're not already familiar with cameras–changing the size of this aperture has *no* effect on the size of the image you get on the film. Whether the opening that lets the light through is large or small, the image will fully cover the picture area on the film.

7 Film advance

This is a mechanism for moving the film through your camera. In cameras using roll films, it may include two spools. The film winds off the first, is pulled across the back of the camera, and finally is wound up on a second, "take-up" spool. In the simplest roll-film cameras, this is accomplished by turning a knob on the outside of the camera, attached to the take-up spool.

The film area covered by each picture is called a *frame*. The place in the back of the camera where the film is held flat so that the lens can form a picture on it is called the *film plane*. With simple cameras, after each shot, you turn the knob until a new number appears in a window in the back of the camera. When the new number is centered, a new frame is in place, and you're ready to take another picture.

Cameras that use 35-mm film work a little differently. Thirty-five millimeter film is supplied in a light-tight cartridge. The film is pulled across the back of the camera onto a take-up spool, but after you've taken your last picture the exposed film must be *rewound* into the original cartridge again. Therefore, 35-mm cameras are equipped with a *rewind* device that enables you to do this.

In many of the more advanced 35-mm and roll-film cameras, the film-advance mechanism has a crank or lever which is faster and more convenient to use than a knob. Advancing the film may automatically cock the shutter and move a dial that counts the number of exposures you've taken. The film-advance mechanism may also automatically stop the film when a new frame is in position.

With cameras that use an individual sheet of film for each picture, there is no film-advance mechanism. Instead, you load the film into a *film holder* which you insert into the camera's back each time you are going to shoot. *Film packs* containing a dozen sheets of film also can be used in some models.

How your camera takes a picture

Here, in brief, is how the various parts of your camera work together each time you make a photograph.

First, you look through the viewfinder to aim the camera and compose the picture.

The lightproof body of the camera keeps the inside in total darkness, protecting the light-sensitive film in the back until you're ready to shoot.

When you squeeze the shutter release, the shutter clicks—opening and closing to let light momentarily enter the camera. This is the all-important moment of *exposure* when the picture is actually recorded on the film.

During exposure, rays of light from the subject pass through the lens and the circular opening in the iris diaphragm, and enter the interior of the camera. The lens focuses these rays so that they form an image—a copy or likeness of the subject in front of your camera. The image falls on the film, and the film records it.

The shutter regulates *how long* the light falls on the film, and the iris diaphragm controls the *brightness* of the image focused on the film during the time the shutter is open.

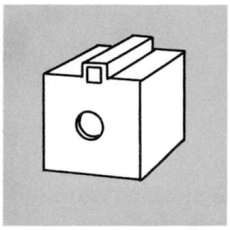
Then, after you've taken the picture, you advance the film so that a new frame is moved into position ready for your next shot.

Described in this concise way, the taking of a picture seems like a simple act. In one sense it is—you can perform the entire sequence in only a few seconds. Yet within that brief time span, optical, mechanical, and chemical events of marvelous precision and complexity take place.

Your main interest in these events is to learn to *control* them in order to have your pictures express what you want to say. Therefore, for the rest of this lesson, we'll take a closer look at each of the important camera parts and adjustments, and show you how to use them effectively and creatively in the wonderful picture-taking process.

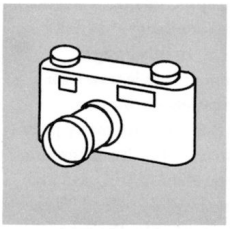
Camera types

At right are some of the different camera types that you should know about. We are introducing them to you now so that you will be able to recognize them when we talk about them. In this and other lessons you will learn more about them and how to use them in a variety of picture-taking situations. In addition to the types illustrated here, there are others. These include very compact subminiature cameras that use film sizes smaller than 35-mm; folding roll-film cameras with the lens attached to a collapsible "bellows" so that the camera can be folded flat when not in use; and Polaroid cameras, which use special films that produce finished prints [and sometimes negatives] in the camera. Also, there are specialized cameras for aerial photography, copying work, and other purposes.



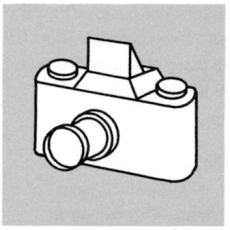
Simple camera

Simple camera uses roll film and has fixed shutter speed, fixed aperture, and fixed focusing.



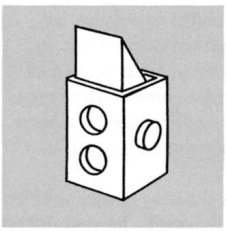
35-mm rangefinder camera

35-mm rangefinder camera uses small, perforated 35-mm film and a viewfinder plus a focusing device called a rangefinder.



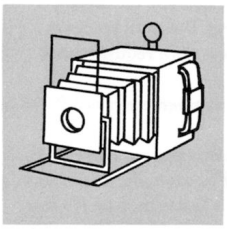
Single-lens reflex camera

Single-lens reflex camera has a mirror behind the lens that reflects an image onto a viewing screen, usually for eye-level viewing. The mirror swings out of the way when you take a picture. Many single-lens reflex cameras use 35-mm film, some use roll film, a few use sheet film.



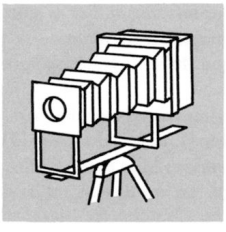
Twin-lens reflex camera

Twin-lens reflex camera has two lenses—one above the other. The top lens is for viewing and focusing, the bottom one actually takes the picture. Most twin-lens reflex cameras put 2 1/4 x 2 1/4 pictures on 120 roll film.



Press camera

Press camera uses sheet film [2 1/4 x 3 1/4-, 3 1/4 x 4 1/4-, or 4x5-inch size]. It has a "groundglass" on the back. This is a special glass screen used for careful focusing and composing of the image. It also usually has an open frame viewfinder and often a rangefinder.



View camera

View camera uses large sheet film [4x5-, 5x7-, or 8x10-inch size], has a groundglass back and adjustments [called "swings and tilts"] to correct distorted perspective and provide other controls.

The lens

To begin our study of the basic camera parts and controls, let's take a look at the all-important "eye" of a camera–the lens itself.

The lens collects light rays from every part of the subject, and focuses them to form a picture inside your camera. This picture–a copy or likeness of the scene outside–is the photographic image. A human face, a tall building, a remote mountain range–anything at which you point your lens–can be reproduced in fine detail in this image.

A lens may be a permanent part of the camera. This is true with most folding roll-film, twin-lens reflex, and inexpensive 35-mm cameras. Or the lens may be removable, as is the case with many press, view, and more advanced 35-mm and roll-film cameras. Such cameras permit you to switch from one type of lens to another at will, and are said to have *interchangeable lenses.* [Some moderately priced 35-mm cameras allow you to change the front lens element only, the rear elements remaining permanently mounted to the camera.]

Two important characteristics of any lens are its *speed* and its *focal length.* We'll introduce you to these two characteristics here, so you'll have a basic understanding of what they are and how they can affect the pictures you take. In later lessons we'll discuss these characteristics in more detail as they apply to different subjects and situations.

Lens speed

Lenses vary in their ability to transmit light to the film. This light-transmitting ability is what we mean when we talk about the speed of a lens, and whether it's a "fast" lens or a "slow" lens. With the same subject and lighting conditions, a fast lens at its widest aperture can deliver a brighter image to the film than a slower lens at its widest aperture. Remember, in photographic terminology, lens speed refers to the lens' ability to transmit light, *not* to its ability to catch action.

A fast lens is not necessarily a "better" lens than a slower one. In fact, some of the lenses that produce the sharpest pictures are only of medium speed. There are optical problems in designing and making a lens that is both fast and sharp. Because of these difficulties, a fast lens usually is more expensive than a slower one of comparable optical quality.

A very fast lens is most useful when you're shooting under conditions of poor illumination and need the extra light that such a lens can deliver.

With today's very light-sensitive films, you don't need a costly, extremely fast lens to take most kinds of pictures. Of course, as you continue to grow as a photographer, you may find you do require a very high-speed lens for some of your shooting. But until you gain enough experience to realistically evaluate your own requirements, don't buy speed you may not need.

The speed of a lens is indicated by an "*f*" number–such as *f*/2, *f*/3.5, *f*/4, etc.

For practical photography, the important thing to remember is that the *smaller* the *f* number, the *faster* the lens. For example, an *f*/2 lens is faster than an *f*/3.5 lens, and an *f*/3.5 lens is faster than an *f*/4 lens.

You can't accurately judge the speed of a lens just by looking at it. Some fast lenses are relatively big, others are relatively small. The important thing to remember is that *any lens rated at a particular f number should have exactly the same light-transmitting ability as any other lens rated at that same number.* For example, all *f*/4 lenses, regardless of size, should have exactly the same ability to transmit light to your film.

In adjustable cameras, the iris diaphragm lets you change the lens opening to admit more or less light as you wish. However, the speed of a lens always indicates its *maximum* ability to deliver light to the film–that is, the amount of light it can transmit with the lens opening at its widest.

Focal length

The second lens characteristic we'll discuss–focal length–is important because it determines the lens' field of view for a particular frame size–how much or how little of a scene it will include in the picture area. As you can see in the photographs on the facing page, using lenses of different focal length on your camera can give you "wide-angle" or "telephoto" views of a subject.

Each lens has a particular focal length that is set at the time it is designed and manufactured. This focal length never changes, even though the lens may be used first on one camera, then on another. ["Zoom" lenses are an important exception. They have variable focal length and will be discussed elsewhere.]

Focal length is the distance from a particular point of the lens to the sharp image it produces at the film plane when focused on an object at "infinity." [In photography, infinity is any relatively great distance from the camera.] To put it another way, any time you set your camera's focusing control at the "infinity" mark [giving you a sharp picture of distant scenes and objects], the lens-to-film distance inside your camera equals the focal length of that lens.

Sometimes focal length is measured in millimeters [abbreviated as mm], sometimes in centimeters [cm], and sometimes in inches. We'll generally use the millimeter measurement in this Course.

Most cameras come equipped with a lens of "normal" focal length. The normal focal length for any camera depends on the size and proportion of the film frame [picture area] to be covered by the image. With a 35-mm camera, about 44 to 58 mm usually is considered normal focal length. With a 120 roll-film twin-lens reflex camera, 75 or 80 mm is normal. With a camera using 4x5-inch sheet film, it's about 150 mm. With a camera using 8x10-inch film, it's about 300 mm. All these focal lengths give a horizontal angle of view from approximately 35 to 45 degrees wide *when used with the film sizes indicated.*

A normal lens is the most versatile workhorse of lenses–*the type used by most photographers to do most jobs.* You'll be able to carry out your lesson assignments with a lens of normal focal length.

Long and short lenses

If you have [or if you eventually acquire] a camera with interchangeable lenses, you'll find this feature can be an advantage. By allowing you to use a lens with longer or shorter than normal focal length, it gives you a choice of telephoto or wide-angle effects.

For example, a lens with *shorter* than normal focal length [usually called a *wide-angle* lens] includes more of a scene than a normal lens would from the same camera position. It has a wider angle of view–up to 100 degrees in some cases. Naturally, the objects within the picture area are recorded smaller than they would be with a normal lens. Wide-angle lenses often are used to give broad, panoramic effects, or to include more of a subject when you can't back away.

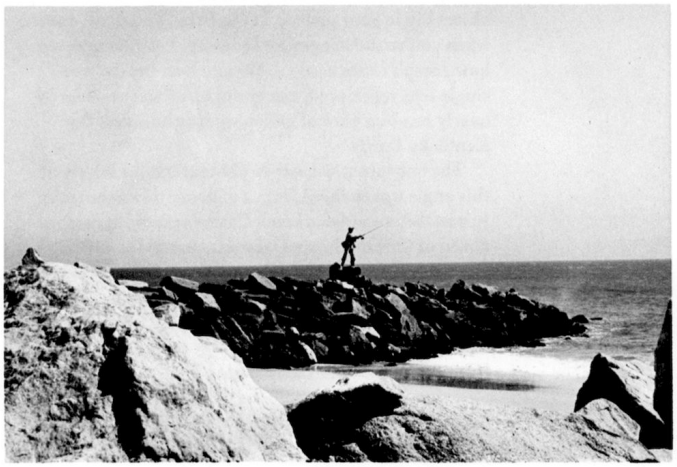
On the other hand, a lens with *longer* than normal focal length [sometimes called a *telelens*] takes in less of a scene but gives you a larger image of any object it includes. An extremely long lens may have an angle of view as narrow as 5 degrees or even less. Long lenses often are used when a photographer can't get close to his subject, as when photographing wild life or shooting sports pictures from the sidelines.

Notice that a certain focal length may be normal for one camera but shorter than normal for another. For example, a 135-mm lens designed for use on a 4x5 camera gives a slightly wide-angle effect, but a 135-mm lens used on a 35-mm camera gives a telephoto effect.

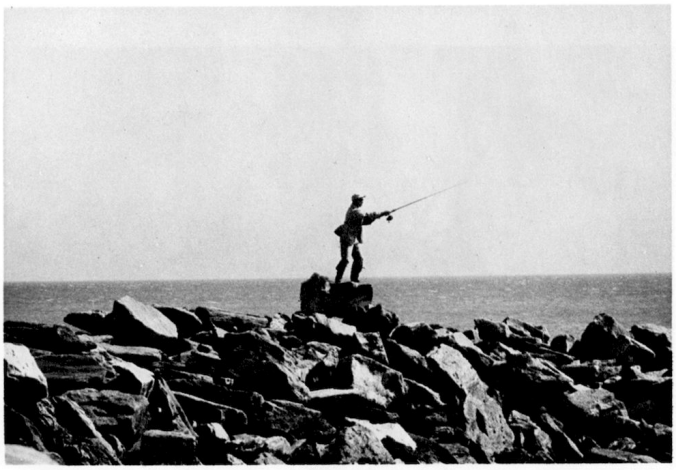
To see how lenses of different focal length can include more or less of a scene, and record objects smaller or larger, study the sequence of photographs on the facing page.

21-mm
wide-angle lens

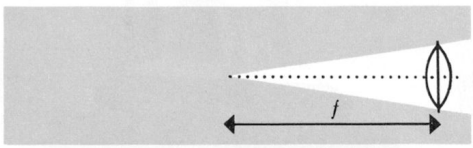
35-mm
wide-angle lens

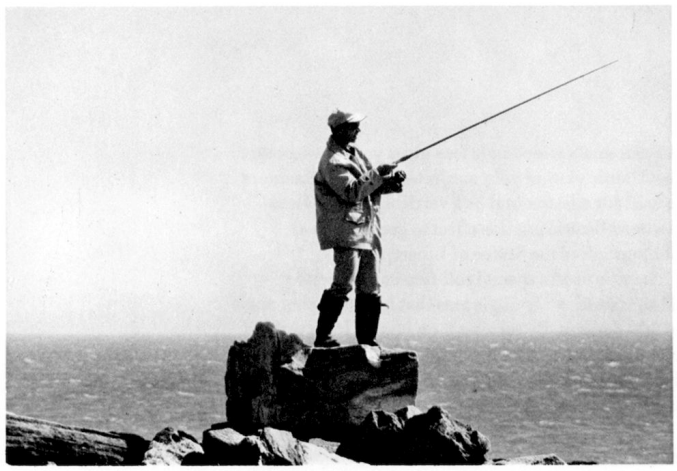


58-mm
normal lens

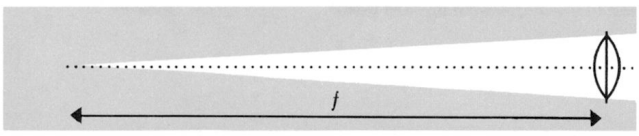


135-mm
long lens





350-mm long lens



How focal length gives wide-angle and telephoto effects

All five of these pictures were made of the same subject from the same camera distance with a 35-mm single-lens reflex camera and interchangeable lenses. All five are reproduced full frame–that is, complete, with no cropping. Each was shot with a lens of different focal length. [The small diagram under each photo shows the relative focal length, indicated by *f*, and angle of view of each lens used.]

Notice how the figure of the surf caster becomes bigger with each increase in focal length, while the total amount of the scene included becomes less and less.

With a very wide-angle 21-mm lens, the foreground rocks dominate the picture, and the figure is tiny. The emphasis is on the scene. With a wide-angle 35-mm lens, the figure becomes slightly larger and we see slightly less of the surrounding rocks. With a normal 58-mm lens, the figure assumes somewhat more importance, and we see only a portion of the foreground rocks. With the long 135-mm lens, the foreground rocks are cut out of the picture altogether. And with the very long 350-mm lens, the surf caster becomes the most important thing in the picture. Thus only by changing lenses, the photographer created quite different effects in these pictures.

Using long and wide-angle lenses

Although a lens of normal focal length with its normal angle of view is satisfactory for most picture-taking situations, there are times when long or wide-angle lenses help a photographer show the subject more vividly, and express his meaning more clearly. They allow him to include more of a scene from his shooting position, or to show less but record it larger on his film. Here are four examples by members of your Guiding Faculty.

A long lens is useful when you want to show a distant object big in your picture. It can bring you close, even when you're shooting from far away. For example, see how Joseph Costa used a 1000-mm long lens on a 5x7 single-lens reflex press camera to catch an exciting, nearly head-on view of galloping race horses at the Kentucky Derby.

The only practical way to photograph the horses at this angle was to shoot from a distance down the track just as they rounded a bend. Costa focused his camera ahead of time on the spot where he wanted to catch the race horses, waited with his camera actually resting on the ground to steady it and the long, heavy lens. When the horses thundered past the target point, he shot–and this is the result.
[Courtesy New York *Daily News*]

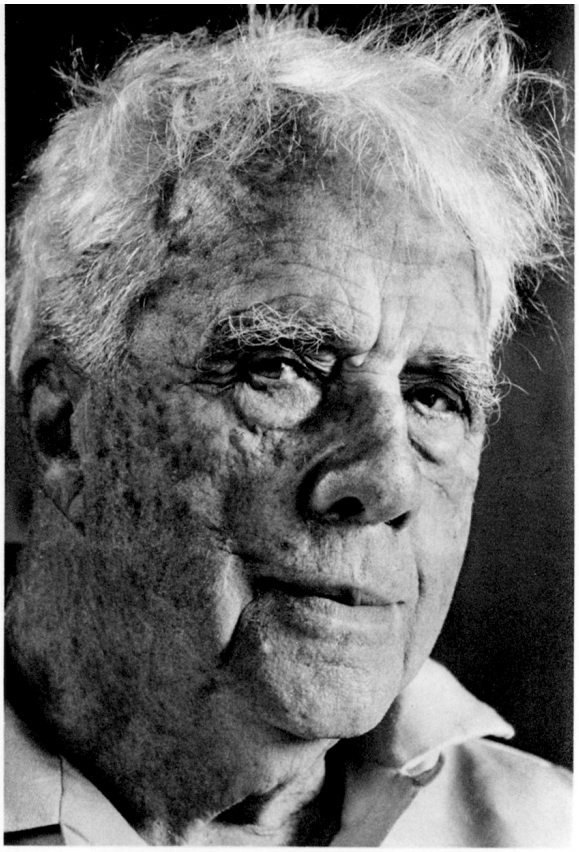
An extremely wide-angle lens gives you a sweeping, panoramic view of your subject–whether the camera is used for a horizontal or a vertical picture. Here Richard Beattie put this effect to good use in a photograph of the Statue of Liberty.

Beattie used a special roll-film camera with a 47-mm super-wide-angle lens that has a viewing angle of 100 degrees. By turning it on its side for a vertical composition, he was able to include the father and son in the foreground at the foot of the statue as well as the top of the torch.

The narrow vertical format of the picture emphasizes the feeling of height the photographer wanted to convey. Notice how the line of the father's pointing arm leads into the outline of the statue's base and accentuates the upward thrust.

A wide-angle view can add a feeling of space to your pictures, and is helpful when you want to include both the subject and some important detail of his surroundings in the same picture. For example, Alfred Eisenstaedt chose to use a 28-mm wide-angle lens on his 35-mm rangefinder camera for this photograph of pianist Van Cliburn at Carnegie Hall.

Here, Van Cliburn was trying out a new piano at rehearsal just before concert time. Eisenstaedt was shooting from the wings, with his camera on a tripod, using theater illumination only. He wanted to include the ring of lights high above Van Cliburn's head as a strong design element, and record the pianist as a small, brightly lighted figure isolated in the black space of the empty concert hall. With his camera turned on its side for a vertical picture, the wide-angle lens gave him the extended view he needed. A normal focal-length lens would not have allowed him to include both the pianist and the overhead lights in one picture from this camera position.
[Courtesy *Life* magazine, ©Time, Inc.]



A long lens comes in handy in making portraits—it gives you a large, frame-filling image of the person's head while allowing you to shoot from a comfortable distance. To get equal image size with a normal lens requires you to move closer to the subject. This may cause your subject to be unduly camera-conscious and make it difficult for him to relax. [It can also cause distortion, so that a nose, chin, or other part of the face looks too big.]

Alfred Eisenstaedt shows you a good method for making candid portraits with a long lens in this sharply detailed portrait of poet Robert Frost. It was one of many hundreds of pictures taken by Eisenstaedt while visiting Frost on his Vermont farm for a *Time* story.

Eisenstaedt placed his 35-mm rangefinder camera on a tripod in front of the seated Frost, carefully focused the long 135-mm lens with the aid of a reflex viewing device, engaged Frost in conversation, then shot when he saw an expression he liked.

"With a long lens and your camera on a tripod, you can talk to people face to face, and they soon forget the camera," says Eisenstaedt.
[Courtesy *Time* magazine, ©1958, Time, Inc.]

Viewing systems

One of the most important features of any camera is its viewing system, which shows you what you will capture on film. Key decisions are made as you look through the viewing system. A crucial moment is the instant when you decide to trip the shutter–and that decision is based largely on what your viewing system shows you.

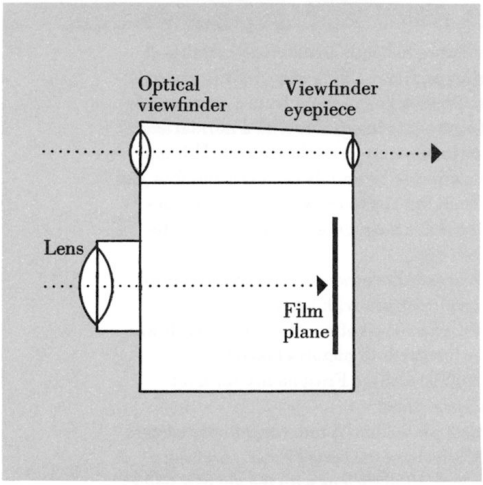
Sometimes, as when photographing a still life or landscape, you'll have ample time to study the arrangement of shapes, the play of light and shadow, the effect of different camera angles. But other times you'll need to react instantly to catch a fleeting pose, expression, action, or pattern of moving shapes. Either way–when deliberately composing or when responding with split-second speed–a clear, accurate viewing system can help you make the right decisions.

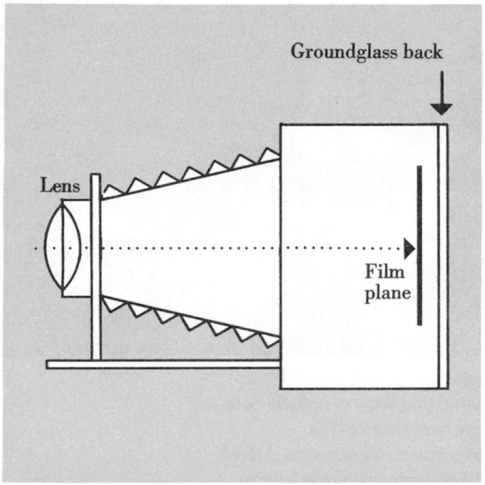
With some systems you look through a viewfinder to survey the scene you will photograph. This viewfinder may be as simple as a peepsight and open frame of wire which shows approximately how much of the subject you'll include in the picture. Such open frame finders are sometimes called "sports finders" because they are most useful when following and shooting a moving subject such as you often encounter in sports photography. They usually are found as an alternate viewing method on cameras that also have a more precise system.

An *optical viewfinder* uses a lens or an arrangement of lenses to give you a bright, clear view of the subject in front of your camera. The great majority of optical viewfinders are designed for eye-level use.

Other types of viewing systems use a translucent sheet of glass ground on one side [called a *groundglass*] upon which an image of the subject is focused. This groundglass sometimes is found in the back of the camera, sometimes on its top.

Here we'll explain four of the most common types of viewing systems–the optical viewfinder type, and three using a groundglass–the view camera, single-lens reflex, and twin-lens reflex. All four types are used by members of your Guiding Faculty. It's likely that the camera you now own includes one of these four types of viewing systems, but you should be familiar in a general way with all four types as they will be mentioned from time to time throughout this Course.





Optical viewfinder

This is one of the most widely used viewing systems. You'll find optical viewfinders built in or as an accessory on many types of cameras.

The most common professional camera using an optical viewfinder is the "rangefinder" 35-mm camera. It's called this because the optical viewfinder is combined with a *rangefinder* for focusing. On most models you view and focus through the same eyepiece, the rangefinder putting a bright or colored *focusing spot* in the center of the viewfinding area. You focus by adjusting the lens until two partly overlapping images of the subject coincide and become one. We'll demonstrate this later.

An important thing to remember about any optical viewfinder is that while it can show you the limits of the picture you are taking, it does *not* show you the exact image you'll get on the film. *Everything* you see through an optical viewfinder looks sharp, even though some objects will be recorded unsharp in the picture. For example, you can't see that a tree branch in the foreground may appear blurred, or that a background mountain may be recorded out of focus.

A well-designed optical viewfinder gives you a bright, clear, evenly illuminated viewing image, and therefore often is a good choice for photography in dim light. This, plus the fact that rangefinder focusing is quick, sure, and highly accurate, makes the viewfinder-rangefinder combination very useful for sports, action, and candid photography.

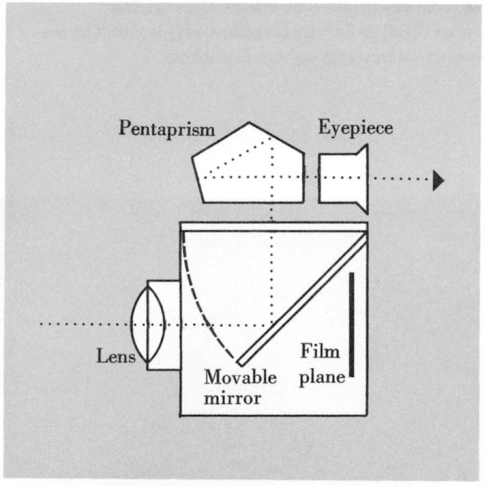
Groundglass back

A groundglass located in the back of the camera is commonly found on larger types of cameras such as view and press cameras, which use individual sheets of film. Here the lens projects the image onto the groundglass. You can see exactly what the lens sees, including which objects are sharp and which are blurred. The image registered on the film is exactly the same size as the one you see. With this type of viewing system, you view and focus by opening the shutter and moving the lens in and out while observing the effect directly on the groundglass.

A groundglass back gives you a relatively large image that can help you focus and compose with great precision.

The groundglass image is upside down and reversed left to right [as shown in the photograph at the beginning of this lesson]. Some photographers find this awkward to work with, although others adapt to it and learn to see upside down as readily as they do right side up.

Before you take a picture, you insert a sheet of film in a holder into the back of the camera. The holder pushes back the groundglass, and the film takes exactly the position formerly occupied by it. Since the groundglass is now blocked, you can't see the image at the time you take the picture. For this reason, working with a groundglass is practical only if the subject is stationary, and the camera is on a tripod. It lends itself best to careful, controlled photography of still life, architecture, landscapes, and posed people.



Single-lens reflex

The single-lens reflex system of viewing is found on many 35-mm, some roll-film cameras, and a few sheet-film cameras. With a single-lens reflex [or SLR, as it's sometimes called] you actually view the image that the lens projects into the camera. As with the groundglass back of a view camera, you can see, by looking at this image, exactly what objects are in sharp focus and what objects aren't.

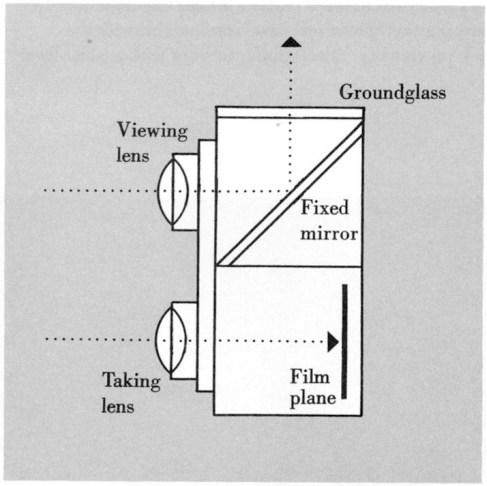
The heart of a single-lens system–the basic device that makes it work–is a mirror placed at a 45-degree angle inside the camera behind the lens. The mirror reflects the image from the lens upward and onto a groundglass on top of the camera for viewing and focusing. When you take a picture, the mirror swings out of the way, letting the image fall on the film. Of course, when this happens, the viewing screen blacks out. Many models have an "instant return" mirror, which quickly flips out of the way and back into position again so that you lose the image only momentarily, at the instant of taking the picture.

A few SLR's are designed for waist-level viewing. The image you see is upright, but is reversed left to right. However, most modern single-lens reflex cameras have a five-sided glass prism placed above the groundglass. This "pentaprism" causes the light rays coming from the groundglass to perform some complicated acrobatics and gives you an *unreversed* upright image for *eye-level* viewing.

Because it lets you actually view the same image that will fall on the film when you take a picture, a single-lens reflex can be especially useful for close-up photography, where focusing and positioning your subject accurately within the film frame require special care. It lets you "frame" the subject precisely, and can show you how much of the subject is in sharp focus. If you change from one lens to another, the SLR shows you the viewing angle given by the new lens.

Some SLR cameras offer a choice of focusing methods. These include a rangefinder spot in the center of the viewing area in addition to the groundglass type of focusing.

Generally, it's more convenient to focus and view with the lens opening at its widest, to give the brightest possible image, even though you want to use a smaller opening when you take the picture. Therefore, many single-lens reflex cameras are equipped with an *automatic diaphragm*. With this, you select the lens opening to be used in picture taking, do your focusing and viewing with the lens wide open, and then take the picture. When the shutter release is pushed, the iris diaphragm automatically closes down to your selected opening.



Twin-lens reflex

The twin-lens reflex viewing system is most commonly found on 120-size roll-film cameras. It uses a matched pair of lenses, working in unison, one located above the other. The top lens focuses an image onto a groundglass for waist-level viewing, the bottom lens puts a similar image onto the film. Thus, you never lose sight of the image as you do with a single-lens reflex. You see the subject upright, but with left and right reversed. When this viewing image is in sharp focus, so is the image that falls on the film.

However, keep in mind that what you see on the groundglass of a twin-lens camera may not be exactly what you get on the film. The viewing lens has an opening of fixed size, usually slightly larger than the widest opening of the taking lens. This gives you a bright image on the groundglass and shows you approximately what objects will be sharp and what objects unsharp *if the taking lens is wide open.*

The twin-lens reflex is designed basically for waist-level shooting, but it easily can be used in a variety of other positions, too. In fact, many photographers find the twin-lens reflex a good choice for most picture-taking situations. In addition to the versatility of its viewfinding system, they like the 2 1/4 x 2 1/4 square pictures this type of camera produces on 120 roll film. The camera is small enough to be mobile, but the negatives are big enough to make it easy for you to get high-quality prints and enlargements from them.

Viewing systems in use

Good pictures can be made with any viewfinding system that's accurate enough to help you aim the camera and position the subject within the film frame. Which type you choose is partly a matter of personal taste. For example, some photographers feel more comfortable with the directness of eye-level viewing; others prefer to work with a waist-level viewfinder. Partly, too, it's a matter of the kind of picture you're taking. Each system has certain advantages and disadvantages, or is more convenient under some conditions than others. Here are four photographs by your Guiding Faculty that show a typical–but by no means the *only*–use of each system we've talked about.

Groundglass back

This complex yet orderly group portrait by Irving Penn is a fine example of the kind of picture that lends itself to groundglass viewing–posed, nonmoving subjects which the photographer wishes to record in meticulous detail.

Penn's assignment was to do a group portrait of the American Ballet Theatre company. He chose an 8 x 10 view camera because its large film size could capture maximum detail, and because the big groundglass image on the back could help him compose precisely, placing the eleven figures in exact, subtle relationship to each other. He could see exactly what happened as he adjusted his lighting so that strong but slightly diffuse illumination fell on the group from high in front. Also, he could control sharpness because he was able to see the actual image in the same large scale as it would be in the negative.

Penn and other photographers often choose a large camera with a groundglass back for carefully posed, deliberate portraiture as well as for landscapes, architectural subjects, and still lifes. Of course, successful photographs of these subjects can also be made with smaller-size cameras and other types of viewing systems. But a camera with a groundglass back is particularly advantageous for recording them. [Courtesy *Vogue*, ©1948, Condé Nast Publications, Inc.]

Optical viewfinder

A 35-mm camera with combined viewfinder and rangefinder was used by Alfred Eisenstaedt to shoot this candid picture of an angry witness, Frank Costello, at a Congressional investigation of gambling. This was a logical choice of equipment, because Eisenstaedt wanted a light, compact, and mobile camera; direct, eye-level viewing; and fast, accurate focusing in order to shoot quickly.

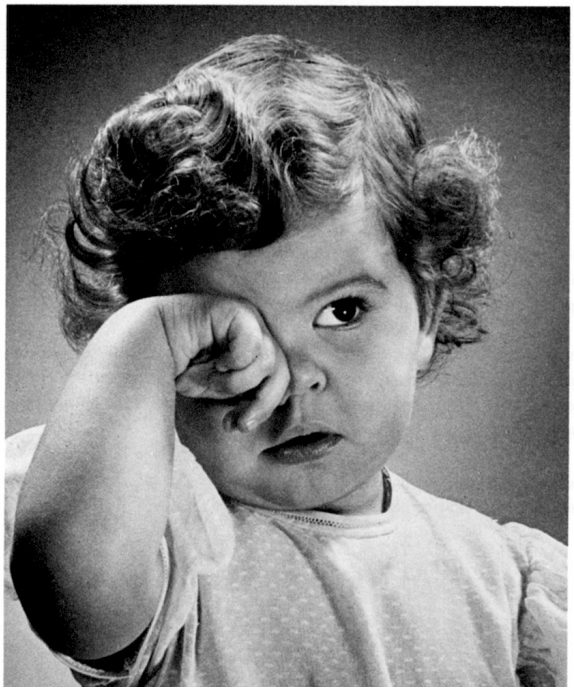
Eisenstaedt sat at a table near the witness stand as the hearings were being conducted in a New York courtroom. He was not allowed to use flash but had to shoot by the illumination in the room.

There's no shooting script when covering a story like this—events are as swift and unpredictable as life itself. But the small camera with its eye-level finder helped the photographer follow the action and react swiftly to catch the most dramatic moments. At the instant shown, Frank Costello had unexpectedly leaped to his feet. Eisenstaedt caught his defiant stance and expression at their peak. A moment later, Costello turned and walked out of the courtroom. A photographer who wasn't alert, or who was using equipment that could not be operated as rapidly as a rangefinder 35, could have missed the best shot of the hearings.
[Courtesy *Life* magazine, ©Time, Inc.]

Single-lens reflex

The single-lens reflex system combines through-the-lens viewing with the mobility of a small hand-held camera. Although used for many kinds of photography, it's especially convenient for close-ups [allowing you to frame the subject more precisely than with an optical viewfinder] and with interchangeable lenses [it shows you how much of the subject each lens includes]. Bert Stern used both these advantages in his portrait of ballerina Allegra Kent.

To get this startling close-up, Stern chose a roll-film single-lens reflex camera with a long [180-mm] lens for a bigger-than-normal image; this way he didn't have to move in so close to the subject that distortion of the face would become a problem. The through-the-lens viewing showed him how much of the head was included, and enabled him to position it so that the top of the eyebrows came just below the top edge of the picture.



Twin-lens reflex

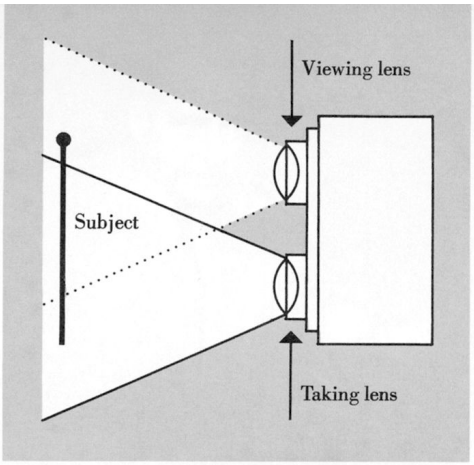
This versatile viewing system often is the choice of photographers who prefer to look *at* a waist-level viewing screen rather than *through* an eye-level finder. Harry Garfield sometimes uses a twin-lens reflex for his portraits of children. He particularly likes the more friendly and intimate "child's-eye" viewpoint that waist-level viewing and shooting give him. Here he used a twin-lens reflex, hand held at waist level, to catch a natural gesture as the little girl moved around his studio. However, the twin-lens camera can also be placed on a tripod for a more formal kind of portrait. [During printing, the square picture was cropped slightly to the vertical shape you see here.]

Parallax errors in viewfinders

Have you ever inadvertently chopped off the top of somebody's head in taking a picture? Or thought you had the subject centered, but discovered it was off-center when you saw the print? This kind of framing error often is due to *parallax*–the discrepancy between what the viewing system shows you and what the lens actually gets. As the accompanying pictures and diagram show, it's caused by the difference in position between the taking lens and the viewing lens [or viewfinder window]. This usually is located above and sometimes to one side of the taking lens.

Of course, with a single-lens reflex camera or a camera with a groundglass back, there is no parallax error because you're actually seeing *through* the lens. But with twin-lens reflex and optical viewfinder cameras, parallax can be a problem. The distance between the taking lens and the viewing lens or viewfinder window is slight–usually not more than a couple of inches or so. The discrepancy between the two points of view can be ignored when you're focusing on a distant subject. But at close distances–usually about eight feet and less–the parallax error becomes increasingly important and must be corrected.

Some cameras do this automatically by shifting the position of the viewfinder frame lines, progressively blocking off part of the viewing screen, or, in the case of some accessory viewfinders, by tilting the viewfinder. Other cameras have a framing guide marked in the viewfinder to guide you when shooting at close distances.



Parallax error can occur with a twin-lens reflex camera used for close-up shooting because the viewing lens sees the subject from a slightly higher position than the taking lens. A similar error can occur with optical viewfinders, which usually are located higher than the lens.

Be sure you read your camera instruction manual carefully to see what system of parallax correction, if any, your particular camera offers, and follow the directions for its use. For a demonstration of what parallax is and how to avoid it, see the two pairs of photographs below.

Uncorrected: The picture at left shows what the photographer saw on the groundglass of his twin-lens reflex. He did not correct for parallax. At right is what he actually got on film. The top of the girl's head is cut off and a leaf is in front of her mouth.

Corrected: When he took the picture a second time, he corrected for parallax by framing the subject in his viewfinder as shown at left, leaving extra space between the girl's head and the top of the viewfinder. In the resulting picture, at right, the girl's head is correctly framed and there is no interfering leaf.

Tips on viewfinding

Whatever type of viewfinding system your camera has, be sure to study the entire area of the groundglass or viewfinder screen. Look at the edges and corners as well as the center. Remember that the camera lens will record everything within its field of view.

Keep your optical or groundglass viewfinding system as scrupulously clean and free of dust as you do your lens. Dirt and dust can reduce the brightness and clarity of the image.

If you use an eye-level viewfinder, hold the camera close to your eye so you can see all four corners of the picture frame lines.

With viewfinder cameras, always double-check to be sure you've removed the lens cap before shooting. [You're able to see a viewfinder image even when the taking lens is covered.]

When focusing with a groundglass back it's usually necessary to place a black *focusing cloth* [or your jacket] over your head and the back of the camera to shield the groundglass from outside light. This allows you to see the image more clearly as you compose and focus.

In close-up shooting, be sure to make allowance for parallax if your camera is a type that requires this.

The three basic camera controls

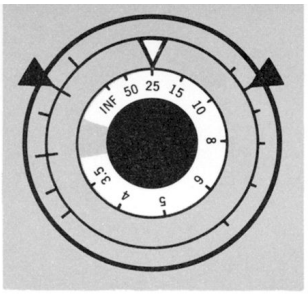
All but the simplest cameras have three important adjustments or controls–*focusing, aperture, and shutter speed*. You must learn to set these controls properly in order to make bright, clear, sharp pictures with an adjustable camera.

There's really nothing mysterious or difficult about these controls, but until you know how to handle them, and understand the effects they can have on your pictures, you won't be able to progress much beyond the "hit-or-miss" approach to photography.

The three controls not only help you make pictures that are good in the *technical* sense–sharply focused, not too light, not too dark, etc.–but they also are important in a *creative* sense. They can enable you to emphasize or subordinate parts of the picture by recording objects in sharp focus or out of focus, and to show a moving object with clearly defined outlines or with various degrees of blur that emphasize the feeling of motion. They can help you *interpret* the subject in a more effective, interesting way.

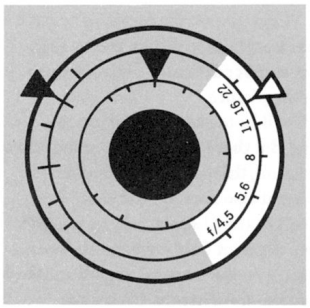
All three controls are interrelated, and using them in different combinations will produce different effects on the picture your camera takes. Before you can use your camera to its full potential, you'll need to become so familiar with the three basic controls that you can apply them without having to stop and ponder about the relationships between them.

In the following pages we'll show you how members of your Guiding Faculty use these controls to make stronger, more interesting and expressive pictures, and how you, too, can apply them in your own shooting. By mastering them thoroughly, you'll be laying the foundation for your continued growth as a photographer.



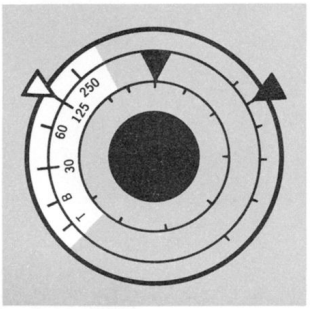
Focusing control

By focusing, we mean adjusting the lens so that it puts a sharp image of the subject onto your film. This diagram shows a typical *focusing scale* of a 35-mm camera. The scale should be set so that the indicator lines up with the distance mark corresponding to the distance from your camera to the subject. Thus the subject will be recorded in sharp focus. Faulty focusing is a common error among beginning photographers, and therefore we'll show you how to focus accurately with various types of cameras. Correctly used, a focusing control can help you emphasize the parts of the picture you want to stand out by making them sharper than the rest of the picture.



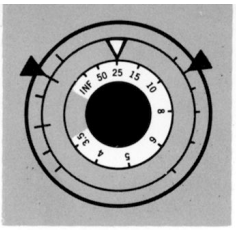
Aperture control

By controlling the aperture [lens opening] at which you shoot a picture, you influence *exposure*–the total amount of light that reaches the film. But aperture has a second important effect, too. It also influences *depth of field*–the total range of sharpness in your pictures from front to back. By using a small aperture, you can increase depth of field. That is, not only the subject that you focus on, but all objects for a certain distance in front of and behind it may also look in sharp focus. The accompanying diagram shows a typical aperture control, located on the lens mount of a camera. The series of numbers correspond to different size apertures. We'll explain these numbers in detail, as well as how to use your aperture control.



Shutter-speed control

A shutter-speed control usually is marked by numbers indicating fractions of a second as shown in this diagram. [Some cameras also have full seconds.] By choosing a slower or a faster shutter speed you can let the light fall on your film for a longer or shorter time. Thus, shutter speed, along with aperture, is an important way to control exposure. Shutter speed also has another important effect: it allows you to control the manner in which moving objects are recorded on the film. With a fast shutter speed you can "freeze" motion and with a slow shutter speed you can show it as blurs or streaks.



Focusing

Getting a picture into focus means adjusting the lens to put a sharp image of the subject onto the film. If you don't focus correctly, you'll get a blurred image of the subject. Focusing is an important step in the picture-taking process, and you should learn to do it accurately.

Simple cameras, as we've said, don't require focusing. You just aim and shoot. Everything from beyond about five or six feet will be recorded in acceptably sharp focus. This certainly is convenient, but it limits your control over the picture. To adjust sharpness precisely, you need a focusing device.

Adjustable cameras give you this kind of control. Generally they allow you to move the lens in and out to focus accurately on objects at different distances from the camera. When you set the focusing control of an adjustable camera, you focus on a particular distance–five feet, say, or 12 feet, or 100 feet. All objects at that particular distance from your lens will be recorded sharply in the picture.

Naturally, your normal procedure will be to focus exactly on the most important object in your picture. But there's more to focusing than this. In addition to the object you focus on, things a certain distance in front of it and a certain distance behind it also may appear sharp in your picture. This total range of objects that will appear sharp is *depth of field*. We'll teach you how to control depth of field later in this lesson.

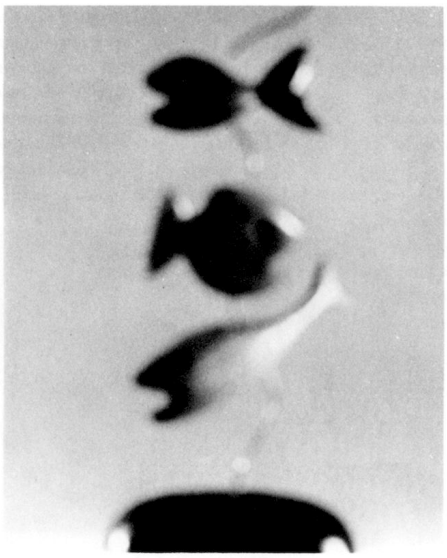
The simplest focusing device is a scale on the camera, usually marked in feet and inches. You measure–or guess–the distance from your camera to your subject, then set this focusing scale accordingly. At one end of the scale will be a mark indicating the closest distance at which you can focus on an object and get a sharp picture of it. At the far end of the scale will be an *infinity mark*. This may be designated by INF or by a symbol like this: ∞. In photography, as we have said, infinity means *any relatively great distance from the camera*. With most 35-mm and roll-film cameras you'll often find the infinity mark just beyond the 100-foot mark on the focusing scale. You set the scale at infinity whenever you want to get distant objects in sharp focus.

Used alone, a focusing scale has obvious disadvantages–you may not have time or be able to measure the distance before shooting. And if you guess, your estimate may be wrong. Therefore, the focusing scale usually is combined with a quicker, more accurate method of focusing–a rangefinder, groundglass or some combination of both. We shall discuss and demonstrate all three methods in these pages.

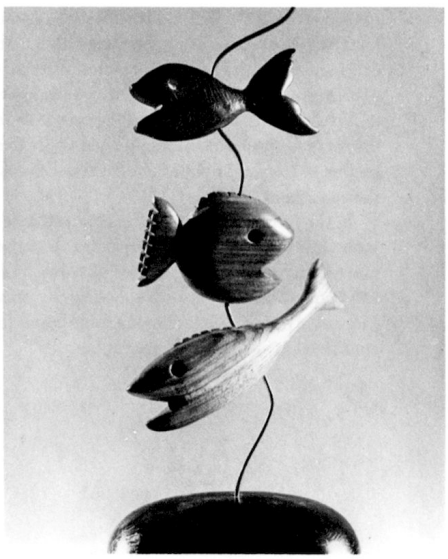
Faulty focusing is one of those common mistakes that just about every beginner makes at one time or another. Sometimes the result is a glaring error–the photographer thought he focused, but didn't. At other times, the error may be more subtle. This can happen when the photographer does focus, but not quite carefully enough. The subject is just a trifle "out" [out of focus, that is]. Although a small print of the picture may look acceptably sharp, the lack of precise focusing will be emphasized in an enlargement.

You can minimize both glaring and subtle errors by getting to know your camera's focusing system thoroughly. Practice focusing on objects at different distances until your motions become automatic. Try focusing in a variety of lighting situations, bad and good. Practice until you know instinctively which way to turn the control to follow an object moving *away* from and one moving *toward* you. [It may help you to remember that you *extend* the lens–move it forward–to focus on a closer object, and *retract* it–move it back–for a more distant object.]

Out of focus



In focus



Groundglass focusing

With this method you watch the image on a groundglass and adjust the focusing control until the image looks sharp. [As we've pointed out, groundglass focusing is provided on view, press, twin-lens reflex, and single-lens reflex cameras.]

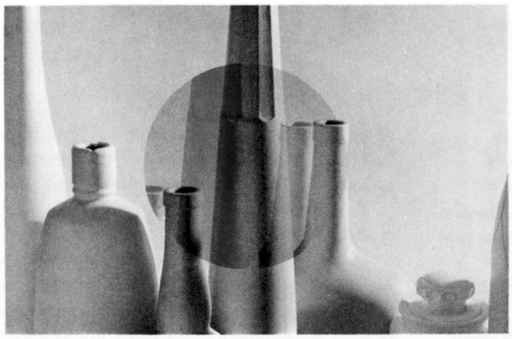
Try this procedure. First, find a clearly lighted, sharp detail on which to focus. [Here, the photographer chose the wire connecting the sculptured fish.] If you're making a portrait, focus on the person's eyes.

With cameras having through-the-lens viewing, you'll probably find it easier to focus with your lens set at its widest aperture. The groundglass image will be brighter, and a finer adjustment of the focusing control will cause a visible change in sharpness. After you're zeroed in on the subject, you can change to a smaller lens opening if necessary.

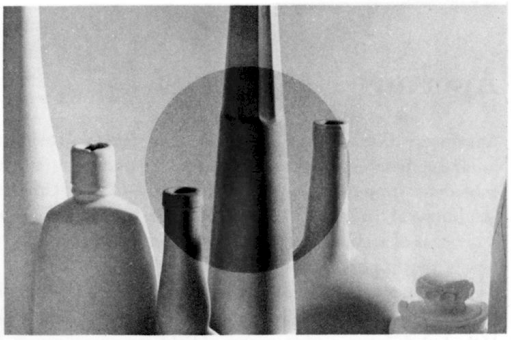
Focusing is really a process of elimination. You move the focusing control back and forth. The image will gradually grow sharper as you approach the point of sharpest focus, then begin to blur again as you pass that point. You gradually narrow the back-and-forth movement of the focusing control until you reach a point where even a slight motion either way makes the detail look less sharp. This must be the point of sharpest focus.

Rangefinder focusing

Out of focus



In focus



The rangefinder most often found in rangefinder 35-mm cameras is the *superimposed-image* type, as shown here. [This type also is called a coincident-image rangefinder.] When you look through the viewfinder you see a bright or colored spot in the center of the viewing area. You aim the camera so that this "rangefinder spot" falls on some clearly defined detail in the subject. [Here it's a portion of three bottles.]

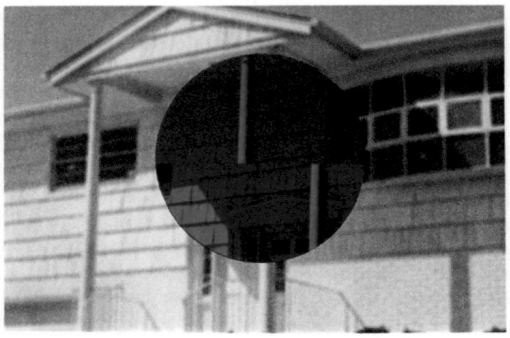
If you see a "double image" effect, as shown in the picture at the left, you aren't in proper focus. You adjust the focusing control until the two out-of-register images of the focusing spot merge and become one, as shown in the picture at the right. This rangefinder is coupled to the lens of the camera, and when the two images are lined up you're in focus.

Some older 35-mm cameras have *split-image* rangefinders, in which the focusing spot is divided horizontally into two distinct halves that must be lined up. Today the split-image type is most commonly found as an alternate focusing method for single-lens reflex cameras, and is so demonstrated below.

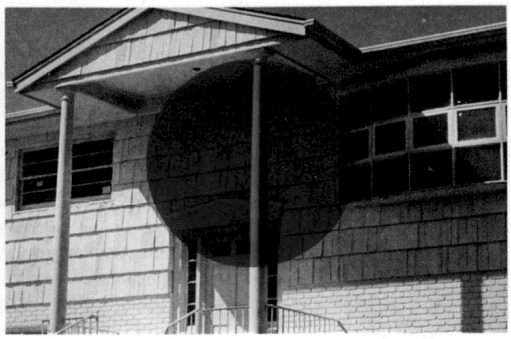
Rangefinder focusing is positive and clear-cut in comparison with groundglass focusing, and is generally easier to do in poor light. It can be used with the camera held on its side for vertical shooting as well as for horizontal pictures.

Combination method

Out of focus



In focus



Many modern single-lens reflex cameras offer you a choice of focusing methods. You use whichever one seems best, depending on the subject, lighting, and your personal taste.

At the left is what you might see if you looked into the eyepiece of such a camera, with the subject out of focus. You have an overall groundglass image for focusing by visual inspection–here quite blurred. In addition, there is a split-image rangefinder focusing spot in the center. Notice that the spot is divided horizontally into a top half and a bottom half. A portion of the image is split into two halves–and the halves don't line up.

With this subject in focus, as at the right, the groundglass image looks sharp and the split image lines up perfectly, top and bottom.

When you use the split-image rangefinder, aim at a distinct vertical line in the subject–a fence, flagpost, the edge of a door or window, the sharp demarcation between a light and dark area, etc. [Of course, you'll try to find a horizontal line if you're shooting vertical pictures with the camera on its side.] Try to have this guide line cut through the *center* of the rangefinding spot. If you get it off to one side, it's likely to impair the accuracy of your focusing–especially in dim light.

There may be an area of extra-fine groundglass or a patterned focusing grid [not shown here]. These are used for fine inspection focusing and clearly show slight changes in image sharpness.

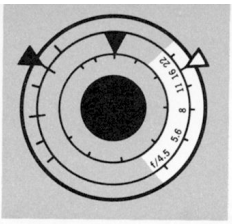
Focusing tips

The closer you get to a subject, the more exact your focusing must be. At short camera-to-subject distances, even a slight error can throw the subject out of focus.

When shooting distant scenes without important foreground objects, you can leave your camera set at infinity. [But be sure the focusing scale is set *exactly* at the infinity mark. On some large cameras it can slip a little beyond the mark, thus throwing your image slightly out of focus.]

When focusing on a very close object, sometimes it's easier to make fine adjustments by bending your body forward or back slightly rather than moving the lens, until the object is in the sharpest possible focus.

If your subject is moving and difficult to keep in focus, it's sometimes a good idea to choose a point which it will pass, and focus on that beforehand. When the subject reaches this target point you know it's sharply in focus, and at that instant you can take the picture.



Aperture

Aperture, we have said, is an important camera control because it influences both *exposure* and *sharpness* in your pictures. First let's consider it from the standpoint of exposure–of how it affects the brightness of the image the lens focuses on your film. Then we'll discuss it in terms of picture sharpness. For a visual demonstration of these two effects, see the photographs on the facing page.

The aperture is the "hole" in the iris diaphragm. This hole admits light into your camera whenever the shutter opens as you take a picture. If the hole is large, a wide stream of light can pass through. If it's small, only a narrow stream of light can enter. [Of course, when the shutter is closed, all light is blocked from entering the camera.] You might think of the iris diaphragm, with its adjustable aperture or opening, as a kind of valve that regulates how much light falls on the film during the time the shutter is open.

The aperture control is usually located on or near the lens mount. It is marked with a series of settings called *stops* or *f stops*. Each of these stops is indicated by an *f* number such as *f*/4, *f*/5.6, *f*/8, etc. [Generally, the *f* is omitted for the sake of space, and just the number is engraved on the control–4, 5.6, and 8, for example.]

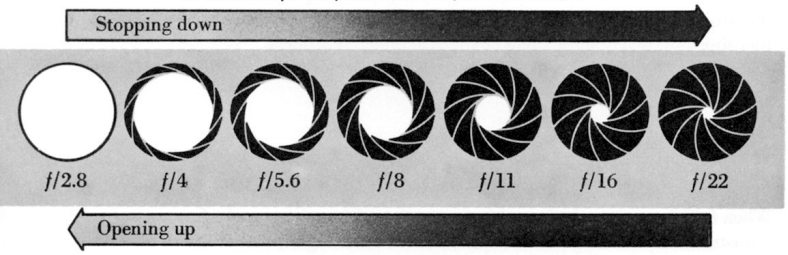
The meaning of *f* stops

You already have been introduced to *f* numbers in our discussion of lens speed. Lens speed, you may remember, is a lens' ability to transmit light to the film when the aperture is "wide open." So another way to tell the speed of any lens is simply to look at the aperture control and find the *f* stop with the smallest number–indicating the largest opening. On an *f*/2 lens, this stop will be marked *f*/2 or 2. On an *f*/3.5 lens it will be *f*/3.5 or 3.5, etc.

An *f* number expresses a mathematical ratio or proportion between the width of the stream of light which enters the camera at that particular opening and the focal length of the lens. It isn't necessary for you to know how *f* numbers are derived [although you'll find this explained in your Technical Manual]. *However, it is very important that you memorize the sequence of* f *stops and thoroughly understand how changing from one to the other affects the brightness of the image reaching the film.*

The range of full *f* stops you should memorize is this: *f*/1, 1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22, 32, 45, 64.

Most cameras offer a limited range of stops. For example, a typical medium-priced camera might have a range running in sequence from *f*/2.8 to *f*/16 or *f*/22. If your camera has a fast lens designed to take pictures in very dim light, the sequence might start at about *f*/1.4 or *f*/2. On the other hand, some cameras designed for studio use with bright artificial lights or outdoors in daylight might offer a range of stops from about *f*/4 or *f*/5.6 down to *f*/32 or even *f*/64.



There are two very simple rules to remember when using *f* stops:

1. Opening up one full stop *doubles* the amount of light transmitted to the film.
2. Closing down one full stop *cuts the amount of light in half.*

The diagram above shows a range of full *f* stops from *f*/2.8 to *f*/22. As the lens is "stopped down," the aperture gets smaller [each full *f* stop down on the scale cuts the amount of light admitted to the camera in half]. As the lens is "opened up," the aperture gets larger [each *f* stop up on the scale doubles the amount of light admitted to the camera].

For example, opening up from *f*/5.6 to *f*/4 doubles the light and closing down from *f*/4 to *f*/5.6 cuts the light in half.

One thing about *f* numbers that sometimes seems to confuse beginners is that moving to a *smaller* number means you're changing to a *larger* aperture and therefore admitting *more* light. It may help you to think of *f* numbers as fractions. For example, think of *f*/4 as 1/4, and *f*/5.6 as 1/5.6. Obviously 1/4 is larger than 1/5.6 and therefore indicates a larger aperture. You "close down" when you change the aperture setting from *f*/4 to *f*/5.6, and "open up" when you go from *f*/5.6 to *f*/4.

Another point to keep clearly in mind: *One lens set at a particular* f *stop should have exactly the same ability to transmit light to the film as any other lens set at that same stop.*

Now is the time for you to become completely familiar with these *f* stops and how opening up or closing down the lens any number of stops affects the brightness of the image focused on your film. For example, you should know without having to stop and puzzle it out that closing down your lens from *f*/2.8 to *f*/5.6 results in one fourth the amount of light reaching the film. [Going from *f*/2.8 to *f*/4 cuts the light in half, and going from *f*/4 to *f*/5.6 cuts it in half again.]

You may find that your lens speed, and consequently the wide-open setting on your aperture control, is something other than one of the *f* stops listed in the sequence of full stops above. For example, the lenses on some 35-mm cameras have a speed of *f*/1.8 or *f*/1.9, and some twin-lens reflex cameras have a lens speed of *f*/3.5. In such cases, just remember that from *f*/1.8 to *f*/2 and from *f*/3.5 to *f*/4 is only about one third of a stop and not a full stop. [For all practical purposes, *f*/1.9 can be considered the same as *f*/2.] The remainder of stops on your aperture control probably will run in normal sequence. [On some older cameras you may find other in-between stops. For a complete list of these stops, see your Technical Manual.]

One of the most common stumbling blocks for beginners is that they do not thoroughly learn the *f* stop system or how to handle it. This is not nearly as difficult or intimidating as it may look at first glance. Just memorize the sequence of full stops and then remember that going one full stop toward the low *f* numbers doubles the exposure, and going one full stop toward the higher *f* numbers cuts it in half.

Aperture and sharpness

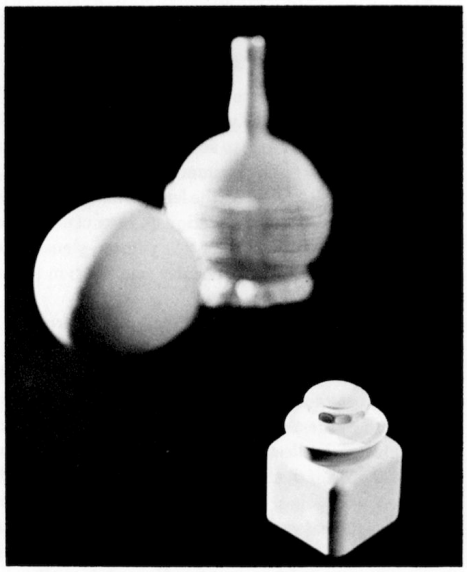
In addition to the way it influences exposure, the aperture has a second important effect on your pictures. It also influences the *total range of objects that will appear in sharp focus.*

Let's explain this with an example. Imagine you are photographing a pretty girl who is ten feet away from the camera. Let's assume you're using a wide aperture. If you focus carefully on the girl, getting a sharp image of her, you may find that a wall a few feet behind her and a bush a few feet in front of her are recorded blurred and out of focus. If you shoot another picture without changing the focusing, but this time using a smaller aperture, you might be able to get both the foreground bush and the background wall sharp as well as the girl. The smaller aperture has increased the total range of sharpness in the picture. It does not necessarily give you a sharper picture of the girl herself. If you focused properly, she should be in sharp focus in both pictures. But it does increase the distance in front of her and behind her so that other objects will be recorded sharply.

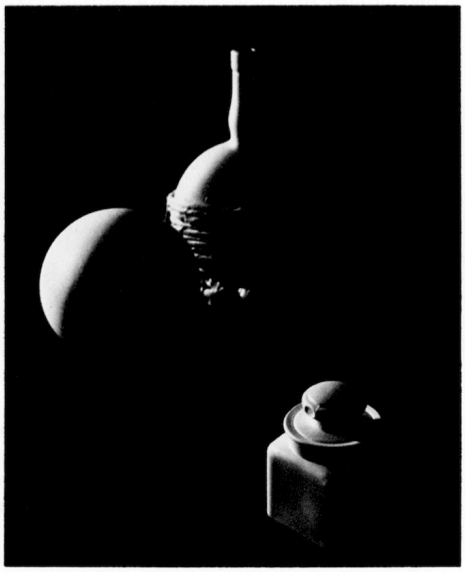
This range of sharpness is called *depth of field*. It is such an important and useful tool for photographers that we will cover it in more detail in the following pages.

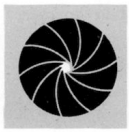
The two effects of aperture

1 Aperture influences exposure



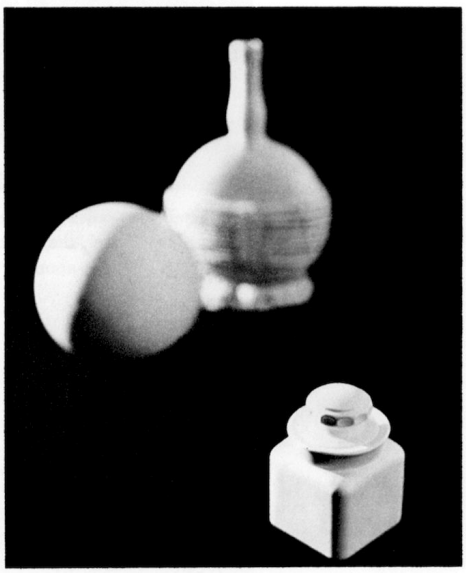
Large aperture: Exposure–the total amount of light that falls on the film when you take a picture–depends both on shutter speed and aperture. In these two pictures we've kept the shutter speed exactly the same–1/50 second–and changed the aperture only. In this particular example, with the lens set at an aperture of *f*/4, the correct amount of light fell on the film to produce a bright picture.



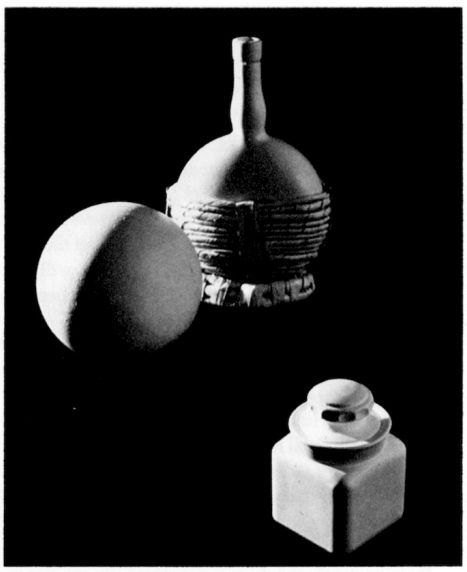


Small aperture: When the lens was stopped down to the much smaller aperture of *f*/22, the picture was darkened because considerably less light reached the film during the exposure time of 1/50 second.

2 Aperture influences sharpness



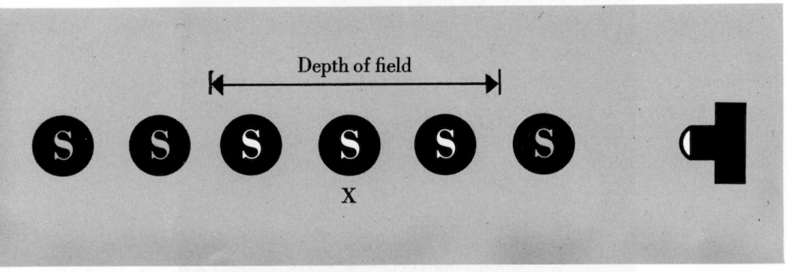
Large aperture: Let's examine the effect of the *f*/4 aperture again, this time in terms of sharpness. The camera is focused on the apothecary jar in the foreground. The jar is recorded crisp and sharp, but the ball and bottle in the background are blurred and out of focus.



Small aperture: Now we stop down to *f*/22 again, without changing the focusing. Although the camera is still focused on the jar, the range of sharpness is increased so that the ball and bottle also are in sharp focus. [We changed the shutter speed to one second in this shot to give normal exposure so that you can more clearly see the increase in sharpness.]

Depth of field

We have just seen how aperture influences the total range of sharpness in your pictures. With your lens set at a particular opening and focused on a particular object, everything for a certain distance in front of that object and for a certain distance behind it will appear to be in sharp focus. This zone of sharpness, we said, is called *depth of field.*



In the diagram, the camera is focused on the black circle marked with an X. The depth of field in this particular example is indicated by the two-headed arrow. All objects within this area will appear sharp in the resulting picture. Objects that are closer to the camera than the near limit of the depth of field or beyond its far limit will appear unsharp–out of focus. [The farther they are from its limits, the more out of focus they will be.]

Depth of field is an important and useful tool for photographers. You can control it to obtain the greatest possible range of sharpness in your picture–to record everything in sharp focus, from nearby objects to far distant ones. Sometimes this is the effect you'll want, but other times you may prefer to use a narrow depth of field. With a narrow enough depth of field, only the subject on which you focus will be recorded in sharp detail. Other things in the picture will be more or less out of focus. Thus you can emphasize the subject and subordinate other details if you wish.

Depth of field also can give you a margin for error when focusing. In a shot with considerable depth of field, a slight focusing error will not be noticed.

With your lens focused on an object at a particular distance, you control depth of field by changing the aperture. *You "stop down" to get more depth of field–to increase the zone of sharpness–and you "open up" to get less.* See the three photographs on the facing page for a graphic demonstration of this effect.

Contrary to popular belief, the smallest apertures don't necessarily give the sharpest pictures. A small aperture increases depth of field, *but it does not necessarily improve the sharpness of the object you focus on.* Actually most lenses perform at their very best in the midrange of apertures rather than wide open or stopped all the way down. For example, a typical *f*/2 lens of a 35-mm camera will most likely produce its top image quality of the object focused on when set somewhere between *f*/4 and *f*/5.6.

Keep in mind that depth of field also *varies as you change focus.* With the camera set at any aperture, depth of field *becomes greater as you focus on more distant objects.*

For example, let's take a 35-mm camera equipped with a lens of normal 50-mm focal length and set the aperture at *f*/8. If you focus on an object six feet away, the depth of field will run from a little less than a foot in front of the object to slightly more than a foot behind it. But if you focus on an object 50 feet away, depth of field will run from about 30 feet in front all the way to "infinity" behind.

Because depth of field gets progressively smaller as you focus at closer and closer distances, you need to be extremely careful to focus accurately when shooting close-ups. Even when your lens is considerably stopped down you don't have as much margin for error as you do when the subject is farther away.

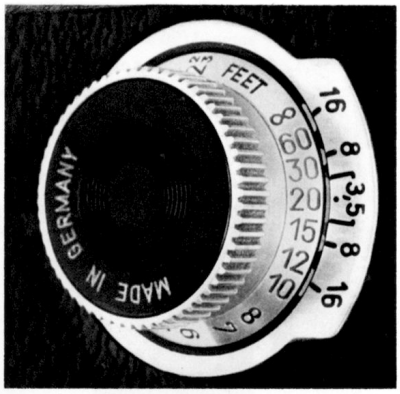
Also keep in mind that the *distribution* of the depth of field in front of and behind the point you focus on shifts with different focusing distances and apertures. At quite close distances it may fall approximately one half in front of and one half behind the point you focus on. At greater focusing distances the proportion changes, and more depth of field falls *behind* the subject than falls in front.

How to use a depth-of-field scale

It's not necessary for you to memorize all the details we've discussed about depth of field. When you use a groundglass back or a single-lens reflex camera it is possible to actually *see* how much depth of field you're getting. With other types of cameras, you can use the *depth-of-field scale* which usually is engraved on the lens mounting or the focusing control. [If you're in doubt as to its location on your camera, check your camera instruction manual.] This scale tells you at a glance how much depth of field you're getting with a particular combination of lens, aperture, and focusing distance.

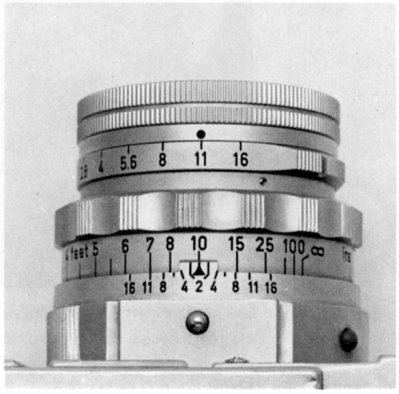
Although these scales vary in details of construction, they all work in much the same way. First you focus, then you look at the scale. You'll see a row of *f* numbers running to the left and right of the focusing dot or arrow. These numbers will be the same on each side of the dot. They run from the largest aperture [located close to and on either side of the dot] to the smallest aperture [located at the far ends of the scale].

On each side of the focusing dot, find the *f* number that matches the aperture you're using. Then, after focusing, find the distance on the focusing scale that each number lines up with. One distance will be the *near* limit of depth of field, and the other will be its *far* limit, at the chosen aperture and focus setting. Regard these distances as approximately safe limits. Keep your principal subject well inside them and you should get an acceptably sharp image.



Twin-lens reflex

The depth-of-field scale of this twin-lens reflex is located on the focusing knob. The lens is focused at 20 feet; the aperture is set at *f*/8. Depth of field runs from about 15 feet to about 30 feet.



35-mm camera

The depth-of-field scale of this 35-mm camera is located on the lens mount. The lens is focused at ten feet; the aperture is set at *f*/11. Depth of field runs from about seven feet to a little beyond 15 feet.

Aperture: *f*/4.7

The photographer focused precisely on the cream pitcher's top front edge. [The lens remains focused on this point for all three pictures.] With the lens at *f*/4.7, depth of field is a narrow band. Note that sharpness drops off abruptly at the edges of the zone of sharp focus. The front of the newspaper and the background objects are very unsharp.

Aperture: *f*/11

When the lens is stopped down to *f*/11, depth of field is about doubled–it now includes more of the tablecloth checks and a wider area of the newspaper. As depth of field increases, the transition from sharp to unsharp at its boundaries becomes more gradual.

Aperture: *f*/32

With the lens stopped down to this very small aperture, the depth of field has greatly increased. Everything from the front edge of the newspaper to the cup and saucer in the background now appears sharp. [In the photodiagrams accompanying these three examples the lines indicating near and far limits of the depth of field are tilted because the camera itself was tilted.]

Two uses of depth of field

A knowledge of depth of field can be a big help to you in many kinds of shooting situations. You can preset your camera so that you are able to shoot quickly without stopping to focus. When you're taking candid pictures of people, covering a sports event, or photographing any kind of fast, unpredictable action, the following two methods can prove very useful.

1 Zone focusing

This simply means setting up your camera before you shoot so that the depth of field–the zone of sharp focus–covers the area where you anticipate the action will take place. Follow these steps:

Prefocus your camera for the approximate distance at which you expect to shoot. For example, about six to eight feet for a party or dance, about 12 to 15 feet for candid street scenes, about 30 to 50 feet for many sporting events seen from the sidelines.

Check your depth-of-field scale to see what the near and far limits of sharp focus are at the aperture you're using. Obviously, the smaller the aperture you can use, the wider the zone of sharp focus.

Don't shoot until the subject enters the zone of sharp focus. As long as the subject remains well within the near and far limits of this zone, you can shoot and be fairly sure of getting a sharply focused image.

2 Getting the most depth

There's a simple way to preset your camera to obtain the *most depth possible* at any required lens opening. This method works best outdoors in light bright enough to permit the use of small apertures. Under these conditions you can convert your adjustable camera into the equivalent of a fixed focus camera, with tremendous depth of field. While this is never a substitute for precise focusing on the subject, it's a useful device when you must "grab" your shots without stopping to focus.

Here's all you need to do: *Align the* f *number on the depth-of-field scale with the infinity mark on the focusing scale.*

For example, let's suppose you're taking pictures with a 35-mm camera equipped with a normal 50-mm lens. Exposure conditions call for an aperture of *f*/16. Move the focusing scale until the infinity mark lines up with the *f*/16 mark on one side of the depth-of-field scale.

Now check the other *f*/16 mark and you'll see that it lines up close to the eight-foot mark on the footage scale. This tells you that your depth of field runs from about eight feet all the way to infinity. That's the most depth you can possibly get with your lens set at *f*/16.

Sharpness: near to far

Often you'll want as much depth of field as you can get, in order to make your pictures sharp from front to back. You'll want to record objects clearly in the foreground, middle ground, and background rather than in just one part of the picture.

The ability to create sharpness from near the camera to "infinity" is one of photography's most striking characteristics. It can enable us to see the subject in a more penetrating way than if we were actually at the scene. The result is a kind of super-realistic vision, a simultaneous rendering of all objects in clear, exact detail. We've shown you how you can achieve a wide range of sharpness in your pictures. Now see how Arthur d'Arazien, Ezra Stoller, and Alfred Eisenstaedt applied this technique in three different situations.

The exact rendition of detail throughout this picture by Arthur d'Arazien adds to its interest. His purpose was to show an entire volunteer fire department in one picture for an advertisement. To do this in an effective way he decided to shoot down from the top of a six-story building, with seven vehicles and numerous firemen positioned in a circular design on a parking lot below.

The photographer used a wide-angle lens on his 8x10 view camera to obtain the angle of view he needed to include all the fire trucks and stopped down to *f*/16 to get considerable depth of field. He wanted great depth of field in order to show everything sharp, from the rungs of the ladder and the face of the nearest ascending fireman to the fire chief's car at the upper left and the truck at the upper right. [Notice that even the lettering on the side of the truck is sharp.]

Ezra Stoller often uses great depth of field in his imaginative architectural photographs to record buildings and interiors with a sharpness that reveals structural details and emphasizes the texture of different materials.

In this view of a French monastery designed by Le Corbusier, Stoller also used depth of field to heighten an impression of deep, three-dimensional space by contrasting a small, sharply focused human figure in the background with the huge entrance area in the foreground–also in sharp focus.

To achieve this extremely great depth of field, Stoller stopped down to *f*/32, using an 8x10 view camera with a moderately wide-angle [200-mm] lens.

Great depth of field clearly reveals the varied expressions on the faces of these student nurses photographed by Alfred Eisenstaedt. The six rows of girls create a fascinating pattern of human beings. To achieve the depth of field he needed, Eisenstaedt stopped down the lens of his 35-mm camera to *f*/8, and focused on the second row of girls.

Eisenstaedt shot this photograph for *Life*, while doing a picture story on Roosevelt Hospital in New York. "I didn't stage it," he says. "The student nurses were watching a mock operation at the time, and the expressions are completely natural."
[Courtesy *Life* magazine, ©Time, Inc.]

Selective focus

On the previous two pages you have seen examples of great depth of field effectively used to get a wide range of sharpness. However, you may not always want *everything* sharp in your pictures. Sometimes you may prefer to use a small depth of field and selective focusing to force the viewer's attention to the most important area or detail in your picture.

By deliberately choosing a narrow depth of field, and focusing exactly on whatever you want to emphasize, you can record that area in sharp detail and throw the rest of the picture out of focus, muting and softening the less important details.

Depending on your subject and the effect you want, there are three basic variations to this method:

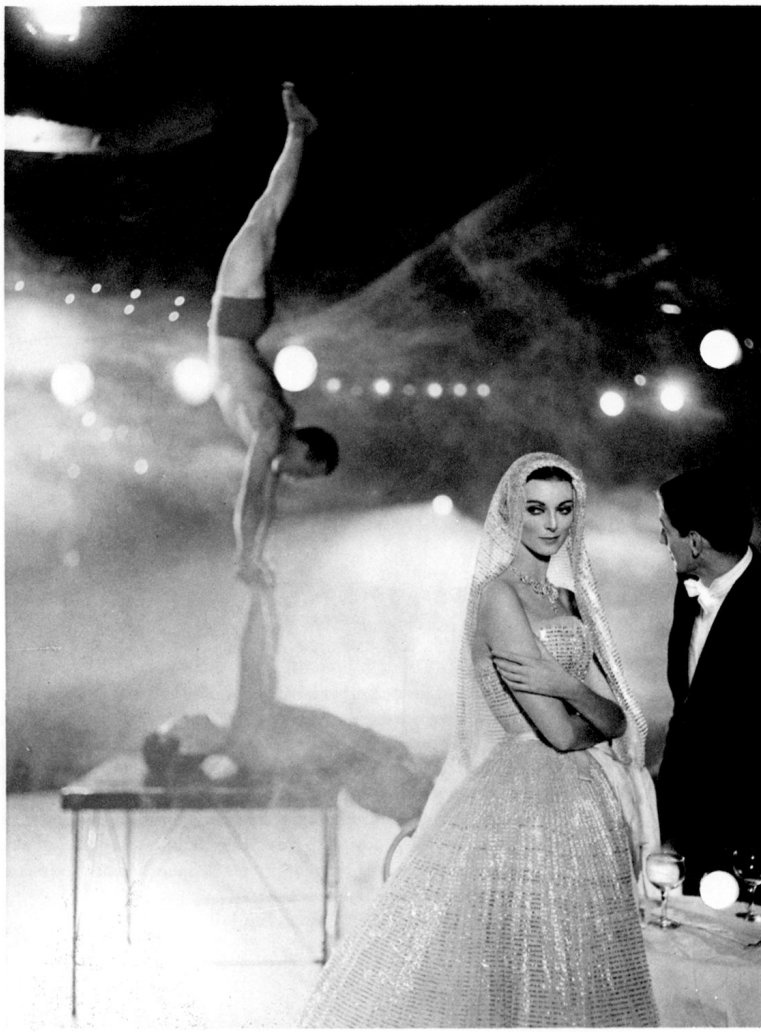
1. Focus on a foreground object, thus blurring the background.
2. Focus on a background object, thus blurring the foreground.
3. Focus on an object in the middle ground, and include both out-of-focus foreground details and an out-of-focus background.

Of these three variations, the first is the most widely used. Nos. 2 and 3 are less common because many photographers–and viewers–feel that a blurred object in the foreground gives an unpleasing effect. However, you may often want to emphasize your subject while subordinating–but not altogether eliminating–detail in the the background. For some imaginative uses of this method, see these photographs by members of your Guiding Faculty.

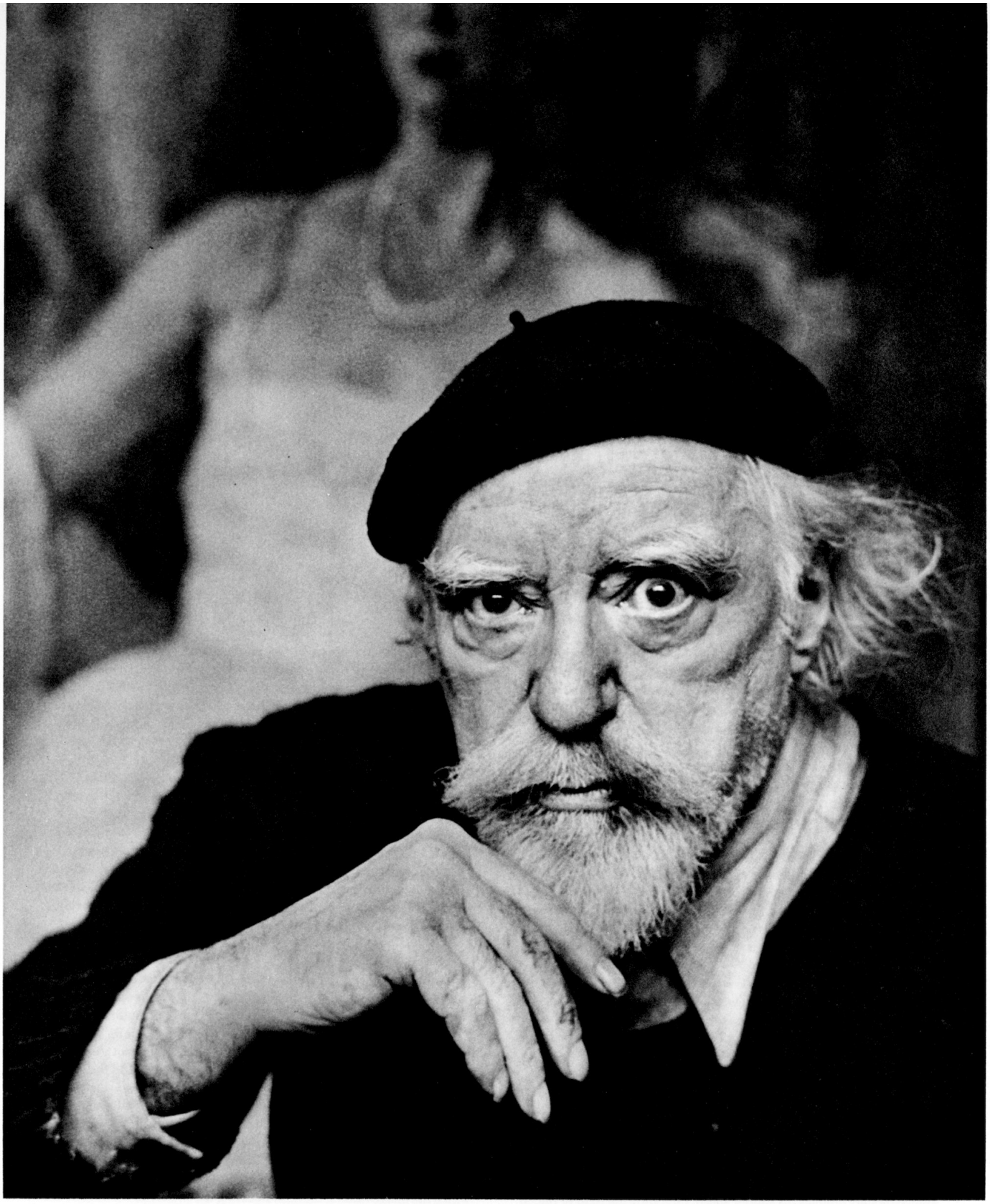
Bert Stern made striking use of selective focus in this advertising photograph for a manufacturer of women's shoes. His purpose was to show the client's product in an atmosphere of romance and glamour. See how the low angle, the close shooting distance, and the narrow zone of sharpness combine to focus your attention instantly on the curved contour of the shoe. By having the model stand on a mirror, Stern added a reflection which picks up and repeats the graceful lines of the heel, toe, and instep, and creates an illusion that the shoe is floating in space.

Stern took this picture at sunset in a park. The man's out-of-focus figure in the background suggests romance, and the setting sun [diffused by horizon haze] adds to the mood.

Notice that, at this close focusing distance, depth of field is very narrow even with the lens set at the relatively small aperture of *f*/16. It was barely wide enough to keep all of the shoe in sharp focus. In controlling depth of field in your pictures, remember to take into account the focusing distance, as well as aperture. [Courtesy I. Miller and Sons Co.]



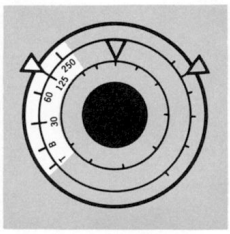
An application of selective focus to a fashion assignment is shown in this photograph by Richard Avedon. He sharply focused his 8x10 view camera on the girl to emphasize her evening dress, and slightly softened the background by using the relatively wide aperture of *f*/4.5. The smoky interior of the night club and the acrobats provide interesting atmosphere, but through the use of selective focus are subordinated to the main theme. Your aim in selective focus should be to achieve *just the right degree of softness* for the effect you want.
[Courtesy *Harper's Bazaar*]



In this dynamic portrait of British painter Augustus John, Alfred Eisenstaedt shows you another interesting use of selective focus. He chose a relatively large aperture [*f*/4.5] and a long lens [135 mm] on his 35-mm rangefinder camera, and focused at a short distance. This produced very shallow depth of field. As a result, the painter's intense eyes and face, in sharp focus against an out-of-focus background, almost seem to leap out of the picture.

Notice how rapidly sharpness falls off at this close-up distance: only the plane of the face is in focus. The left ear and swirls of hair are out of focus. The painting in the background is so softened and blurred that it does not distract attention from the face. Instead, it serves as a suggestive, half-seen symbol of the man's work. Through the device of selective focus, Eisenstaedt emphasized the man, made the painting subordinate.

[Courtesy *Life* magazine, ©Time, Inc.]



Shutter speed

So far you have been learning about two of your basic camera controls: aperture and focus. Now we come to the third–shutter speed. The shutter, you saw earlier, is the device which permits the image formed by the lens to fall on the film for a controlled length of time. The time this image is allowed to reach the film and act upon its light-sensitive surface is called the shutter speed.

Along with aperture, shutter speed is a key method for regulating the total amount of light that reaches the film. If the aperture is like a valve that admits more or less light, the action of the shutter is like turning on this valve for a particular period of time [the shutter speed] and then turning it off again.

However, shutter speed has another very important purpose: It determines how effectively a moving subject can be "stopped"–recorded sharply without streaks or blurs. The shorter the shutter speed, the less time a moving object has to change its position while the shutter is open, and the less its image focused on the film has a chance to move. Obviously, the faster the shutter speed the greater its ability to arrest motion.

For a demonstration of these two basic effects of shutter speed, see the photographs on the facing page.

The simplest cameras usually have a "self-cocking" shutter that opens and closes at one fixed speed–about 1/50 second. More advanced cameras offer a range of shutter speeds.

A typical medium-priced camera might offer the following speeds: 1 second, 1/2 second, 1/4 second, 1/8 second, 1/15 second, 1/30 second, 1/60 second, 1/125 second, and 1/250 second. Shutter speeds up to more than 1/1000 second are available on some cameras. Other cameras have additional settings for exposures longer than a second. [Older types of cameras may use a slightly different series of speeds.] As you can see, in this sequence, moving from one setting to the *next faster* approximately doubles the shutter speed, thus allowing light to fall on the film only half as long as the previous setting. Moving from one setting to the *next slower* cuts the speed in half, thus allowing light to fall on the film twice as long. To regulate shutter speed accurately, use the marked settings only; don't set the control between two speeds.

In addition to this range of speeds, most cameras also have a "T" [for time] setting or "B" [for bulb] setting on their shutter-release dials. These settings allow you to take long exposures of several seconds', minutes', or even hours' duration. They are most useful for making long exposures of outdoor scenes at night, or of dimly lighted subjects indoors. When the camera is used this way, it must be placed on a tripod or other firm support.

With a "T" setting, you trip the shutter once to open it, wait until light has fallen on the film for the desired time, then trip the shutter a second time to close it.

With a "B" setting, you press down the shutter release to open the shutter, and *keep the release pressed down* for as long as you want the shutter to stay open. When you release the pressure, the shutter closes. The "bulb" setting gets its name from a type of shutter, sometimes found on studio cameras, which the photographer opens by squeezing a rubber bulb and closes by releasing the pressure on the bulb.

Types of shutters

There are several types of adjustable shutters. The most common type consists of thin metal blades mounted parallel to the lens opening and activated by a spring mechanism. When you press the shutter release, the blades pivot out of the way, letting light enter the camera. They remain open for the duration of the exposure and then pivot shut. Such shutters usually are located between lens elements or behind the lens.

Another important type of shutter, found on some 35-mm cameras with interchangeable lenses and on some press cameras, is located in the back of the camera near the focal plane where the film lies. A *focal-plane shutter*, as this type is called, usually consists of two curtains made of metal or rubberized cloth, which travel rapidly across the back of the camera, one following the other. Between them is a gap through which the image falls on the film. Locating the shutter in the back of the camera, rather than between lens elements or directly behind the lens, makes it mechanically easier to have interchangeable lenses. Also, the design of this type of shutter allows a somewhat higher shutter speed than do most blade-type shutters.

The two effects of shutter speed

The top pair of photographs shows how shutter speed affects exposure—the faster the shutter speed, the less time the light has to rest on the film, and the darker the picture will be. The bottom pair of photographs shows how shutter speed influences the degree of motion you can arrest. The faster the shutter speed, the greater the ability to record a moving subject without blur.

1 Shutter speed influences exposure

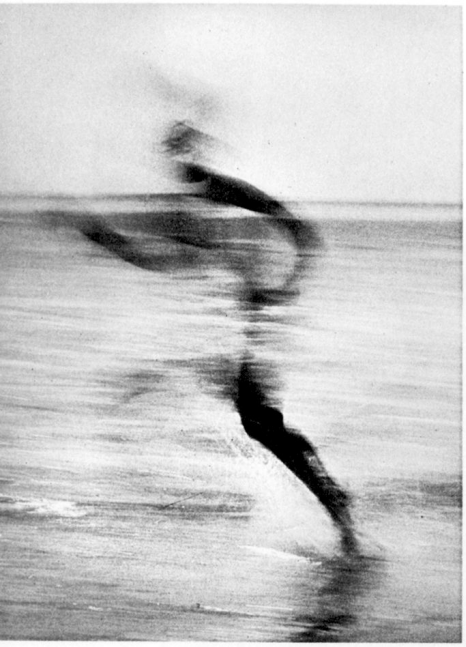
Slow shutter: The longer the shutter remains open when you take a picture, the longer the light falls on the film. In this picture, taken indoors by daylight coming through the window, the film received the right exposure and produced a bright picture with a shutter speed of 1/30 second and an aperture of *f*/8.

Fast shutter: Here the picture was taken with the faster shutter speed of 1/250 second. The light had a shorter time to fall on the film. With the aperture left at *f*/8, the film received too little exposure, producing a picture that is too dark.

2 Shutter speed can stop motion

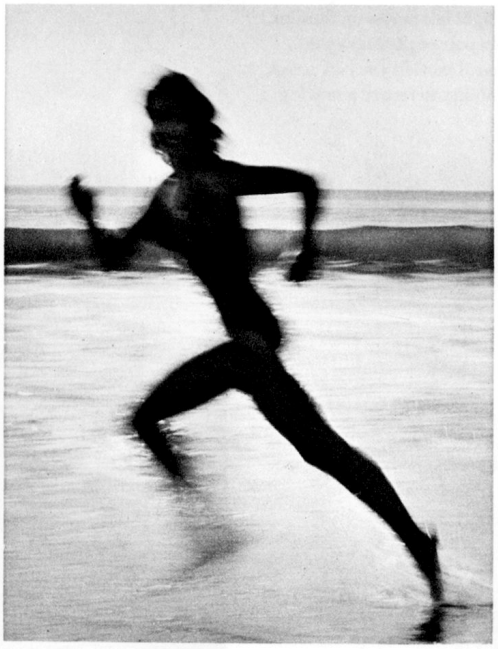
Slow shutter: With a shutter speed of 1/30 second [and an aperture of *f*/8] the picture is correctly exposed. However, with this slow shutter speed the bouncing ball and the girl's rapidly moving hand are recorded as almost indistinguishable streaks.

Fast shutter: At 1/250 second, the shutter is able to "stop" most of the movement of the hand and ball because the image falls on the film for a much briefer period of time. This shorter exposure would greatly reduce the amount of light reaching the film, so the photographer opened up the aperture to let in more light and make the image brighter.



1/8 second

A combination of fast motion and slow shutter speed causes extreme blur. The girl's image is recorded as ghostly streaks.



1/30 second

Some motion is stopped here; the body is a recognizable form. Fast-moving arm and feet remain indistinct.

1/60 second

The figure is somewhat less blurred. Streaks behind her arm and legs suggest motion, like "speed lines" in a cartoon.

Shutter speed and recording motion

As you have seen, the shutter speed you choose has an important effect on how much motion you can record sharply in a picture. A moving subject produces a moving image that travels across your film during the time the shutter is open. By controlling the extent of this travel with a longer or shorter shutter speed you can create a wide range of visual effects, from motion streaks to fully "stopped" motion without a trace of blur.

The slower the shutter speed, the more blur you'll get–all other things being equal. Before we discuss these other things, first study the series of pictures of a girl running, to see what happens when you vary the shutter speed with a fast-moving subject.

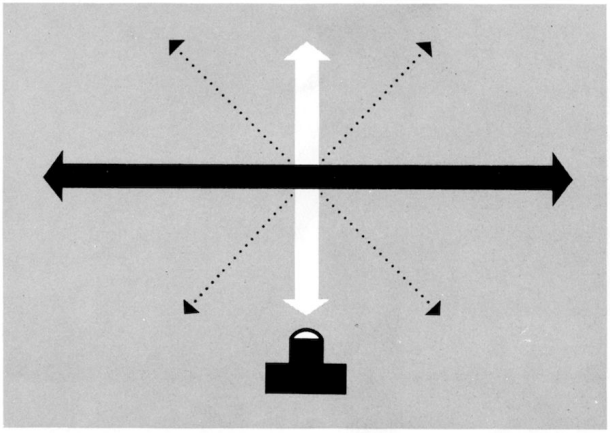
In this sequence, the camera was focused on a predetermined checkpoint. The girl repeatedly ran at top speed directly across the camera's line of view. When she reached the checkpoint, the photographer shot–at speeds ranging from 1/8 to 1/1000 second.

Three other factors to consider

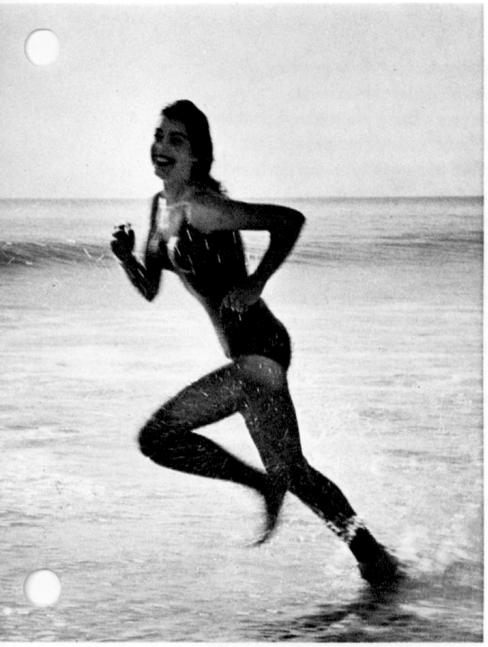
One of the first things you'll discover when you begin shooting action is that the ability of a particular shutter speed to stop motion does not depend only on the speed of the subject. Three other factors are involved. It is important to understand these and keep them in mind when you shoot.

1 Distance: The closer you get to a moving subject, the larger its image–and the faster this image travels across the film. Increase the camera-to-subject distance and you'll reduce both image size and rate of motion. In general, if you want to stop motion more fully, *avoid extreme close-ups of action.*

2 Focal length of lens: A long lens gives you a larger image and faster image movement than a shorter lens does of the same subject at the same distance. Therefore, a given shutter speed will stop less motion when you're using a long lens.

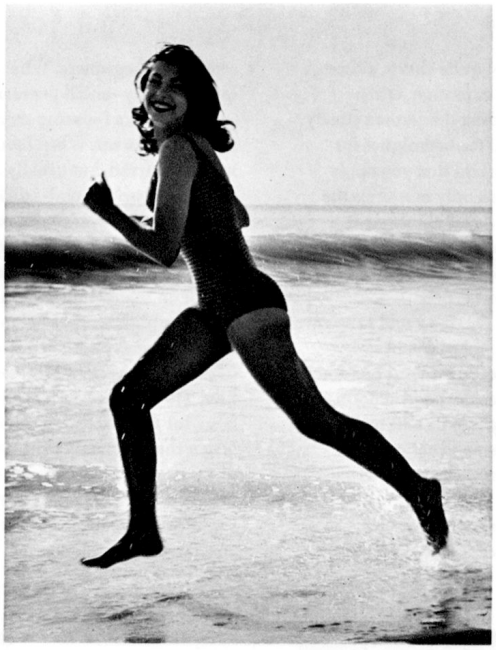


3 Angle of motion: Image motion will be greatest when the subject passes directly across your path, as indicated by the solid black arrow in the diagram above.



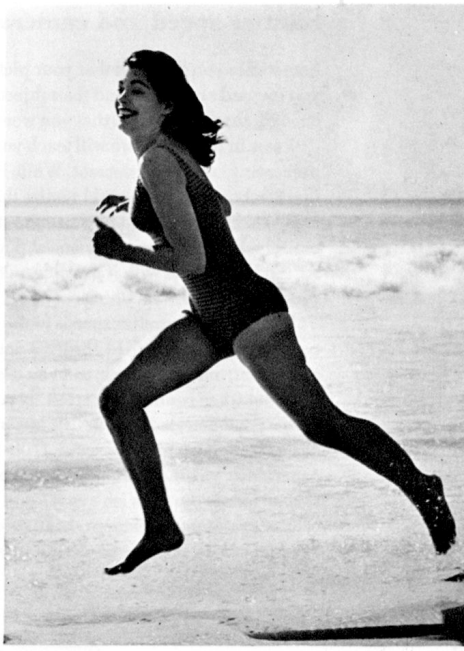
1/125 second

Much of the motion is arrested here, but the girl's face remains unsharp and her fast-moving left foot continues to be blurred.



1/250 second

Most motion is stopped. The face is clearly defined and the pattern on the bathing suit is visible. The feet still show a trace of blur.



1/1000 second

All motion is frozen–with the girl actually in midair. Face, drops of flying spray, and outline of feet are all sharp.
[Photographs by Peter Gowland, and chart, courtesy *Popular Photography*]

Image motion will be the least when the subject is coming directly toward you or moving directly away, as indicated by the white arrow. At intermediate angles–indicated by the dotted arrows–it will be between the two extremes. To increase a shutter's motion-stopping ability, try to catch a moving subject head on or at an intermediate angle–not passing directly across your path.

For suggested shutter speeds to stop a variety of moving subjects at different distances and angles, see the chart at right.

Panning

A good method for increasing the ability of a given shutter speed to stop motion is to "pan" your camera in the direction in which the subject is moving. This system works best with a subject that's traveling along a predictable path–for example, an airplane taking off, an automobile, or horses racing along a track.

Begin by centering the oncoming subject in your viewfinder, then swing your camera in unison with it as it passes you. [This sideways swinging motion of the camera is called *panning.*] You click the shutter just as the subject passes in front of you, then continue to follow it in your viewfinder for a moment. The panning motion should be smooth and continuous, like a good golf swing or tennis stroke, with lots of follow-through.

When you pan the camera correctly, the subject will be relatively motionless in relation to the camera at the instant you shoot. Even a fairly slow shutter speed should be able to record it sharply. Of course the background will be blurred, but this can convey a suggestion of speed.

Suggested shutter speeds to stop motion

Subject	Camera-to-subject distance	Direction of motion		
		↕	⤢	↔
People walking, children playing, sailboats, construction work	12 feet 25 feet 50 feet	1/125 1/60 1/30	1/250 1/125 1/60	1/500 1/250 1/125
Baseball, skating, diving, and other fast sports; motorboats, horse races, automobiles, trains at 20-30 miles per hour	12 feet 25 feet 50 feet	1/500 1/250 1/125	1/1,000 1/500 1/250	* 1/1,000 1/500
Automobile races, trains, planes moving at 60 miles per hour or faster	25 feet 50 feet 100 feet	1/500 1/250 1/125	1/1,000 1/500 1/250	* 1/1,000 1/500

*Pan camera at fastest shutter speed available.

Shutter speed and camera shake

Sometimes you may find that your picture is not quite sharp, although you focused accurately and the subject was not in motion. Often enough, the cause will be that you were not holding the camera steady.

Later in this lesson we will teach you some of the techniques for preventing camera movement. While it is important that you apply these techniques, you should realize that they can only minimize the slight shaking of a hand-held camera–they can never eliminate it entirely. Even such an experienced photographer as Faculty member Alfred Eisenstaedt will, if possible, put his camera on a tripod when shooting in situations which require a slow shutter speed.

Traditionally, shutter speeds in the 1/60- to 1/125-second range are considered fast enough to absorb a normal amount of camera movement, and we recommend you use such speeds for your hand-held shooting when conditions permit. If you practice the good shooting habits demonstrated later in this lesson you ought to be able to make acceptably sharp pictures in the 1/30- to 1/60-second range. With experience, you may be able to hold your camera steady at even slower speeds–but this isn't easy.

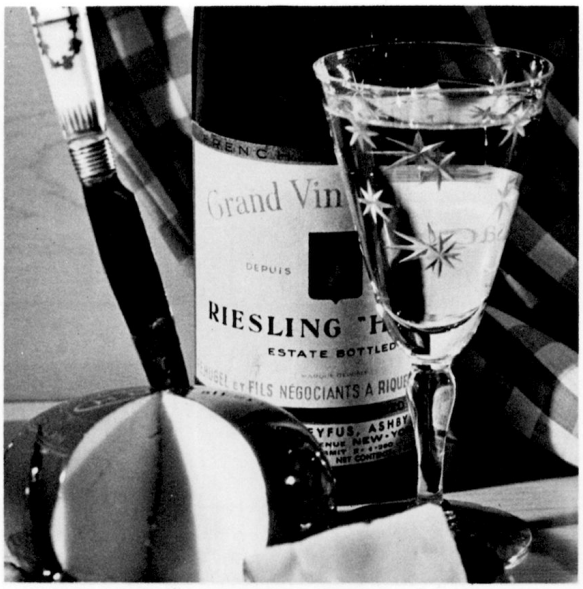
The symptoms of camera shake rarely are as flagrant as the "Common Mistakes" examples you may have seen in books and articles for beginners. What often happens is a subtle degrading of image quality–an all-pervasive softness or general fuzziness.

Of course, a focusing error can give you a fuzzy photograph, but the result is different. When focusing is at fault, your principal subject may be blurred, but usually some portion of the picture–foreground objects or background–will be in sharp focus. With camera shake, the fuzziness is overall. No part of the picture looks critically sharp. And even a slight amount of camera movement can rob your photographs of the clean, crisp quality they should display.

For an interesting demonstration of the evils of a shaky camera, study the photographs below. Both of the small pictures were made with the same roll-film camera, from the same distance, and with identical exposures–1/30 second at *f*/16–on the same medium-speed film. The camera was placed on a tripod for one, held in a not-too-steady hand for the other. Reproduced full-frame in this small size [slightly larger than a contact print of the 2 1/4 x 2 1/4-square negative], both pictures seem at first glance to have approximately equal image quality. However, if you examine the hand-held shot, you'll see an overall fuzziness. To make the difference obvious, we have enlarged a section from each of these pictures.

Camera on tripod– 1/30 second

Camera hand-held– 1/30 second



The tripod shot reveals no camera movement. In the enlargement, notice the crisp rendition of the small letters on the wine-bottle label, the sharp detail in the cut-glass design, the round highlights on the cheese.

In the hand-held shot, by comparison, camera movement has blurred even the large letters, softened the detail on the glass, and turned the highlights on the cheese into streaks. [Highlights recorded as streaks rather than circles are a telltale sign of motion.] You can see why it's important to hold your camera steady. When you want the sharpest possible fine detail, use a tripod.

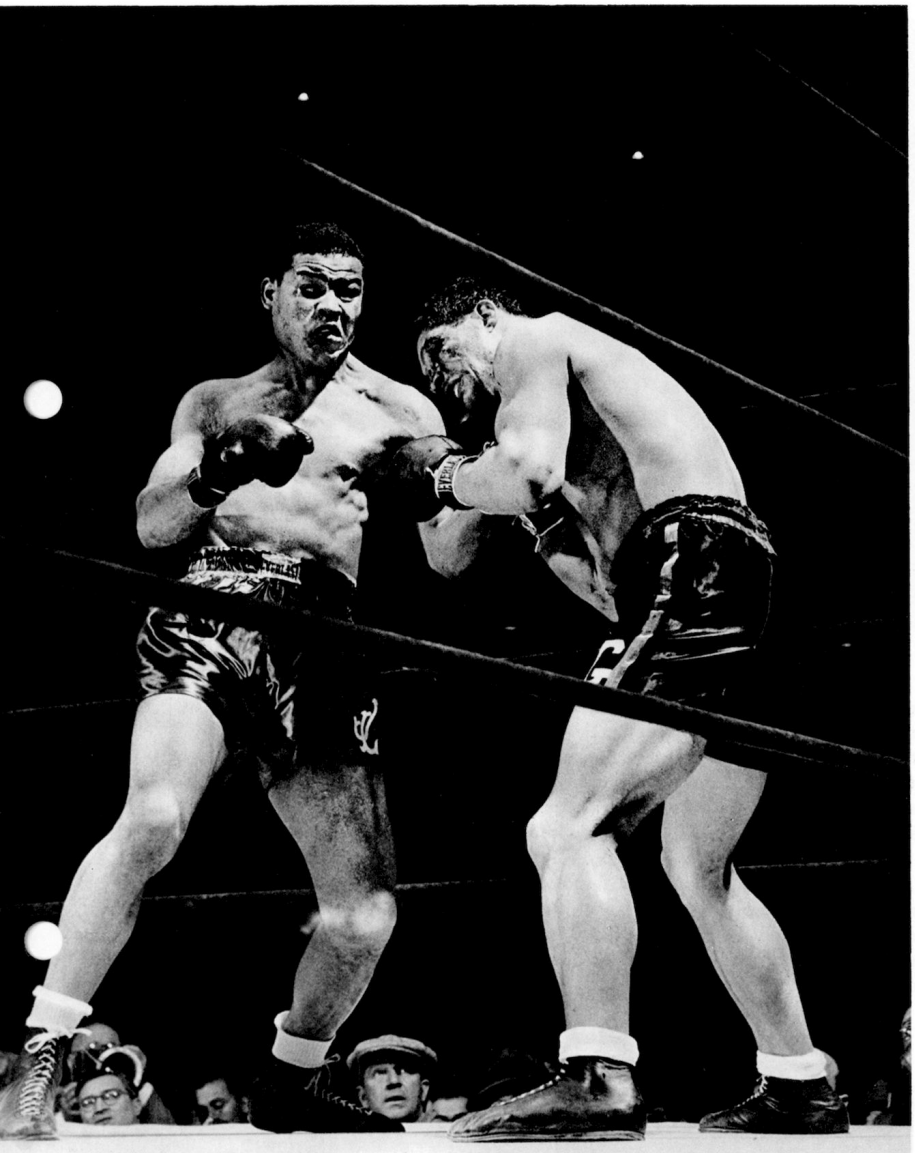
Ways to record motion

Shutter speed gives the creative photographer a chance to record motion in a variety of ways–fully stopped, with a trace of blur, or with extreme streaks. On this and the two following pages we'll show you how members of your Faculty have used shutter speed to achieve various effects with a moving subject.

1 Partial blur–to suggest motion

A still picture, by its very nature, cannot *reproduce* motion; it can only *suggest* or *symbolize* it. When a moving object is frozen by a fast shutter speed, it sometimes looks rigid, static, and unconvincing. Human vision is not accustomed to seeing moving things so distinctly; in fact, a touch of motion streaks or blur in the right place often adds a sense of action and excitement to a photograph, as it does in this picture of the conductor, Charles Munch, by Alfred Eisenstaedt. Notice how the blurred hand and baton make the picture more alive and credible.

Eisenstaedt used a 180-mm lens on his 35-mm camera. This made the subject appear quite large in the frame and emphasized the motion. He shot at a shutter speed of 1/30 second, which caused the rapidly moving hand and baton to be recorded in blurred motion.
[Courtesy *Life* magazine, ©Time, Inc.]



2 Frozen motion

Sometimes you may want to stop fast, violent action completely, as Joseph Costa did in this famous photograph of Joe Louis landing a punch on Arturo Godoy during a heavyweight championship fight. To get this action-stopping ability, you must use a very fast shutter speed or *electronic flash*. The extremely fast "blink" of an electronic flash gives the effect of a very high-speed shutter [the particular equipment used to take this picture flashed on and off in 1/10,000 second]. The use of electronic flash is an important way to increase your camera's ability to arrest motion, as we'll explain in detail in a later lesson.

See how the flash, giving the effect of a very fast shutter speed, froze the contorted face of Louis just as he landed a blow on Godoy's jaw. The camera revealed what few people had ever clearly seen before–that "deadpan" Joe Louis expressed emotion during the heat of battle.

Notice that even though the action is stopped, the picture does not have a static feeling. The dynamic effect is reinforced by the tilt of the boxers' bodies and the diagonal lines of the ropes. This, and the expression, give a powerful feeling of action and violence.
[Courtesy New York *Daily News*]

3 Catching action at its peak

Some kinds of actions have a rhythm–they rise to a peak, then fall away. Watch for this peak, when the moving subject hangs suspended momentarily just before changing from one direction to another. A pendulum at the end of its swing, a pole vaulter at the very top of his jump, a golfer at the end of his stroke, are familiar examples of the peak of an action. Shoot at this instant and even a relatively slow shutter speed can record the subject sharply.

For example, look at Philippe Halsman's photograph of a leaping ballet dancer, where a speed of 1/400 second stopped all the motion. Considering his closeness to the subject and the speed of the dancer's leap, Halsman could not have recorded the motion with extreme sharpness even at a shutter speed of 1/400 second, if he had not caught the motion at its peak.

Halsman, on assignment for *The Saturday Evening Post,* wanted to suggest the idea that the young man's spectacular leaps threw him "higher than an airplane" so he shot the picture at an airport with a plane as a prop in the background.

Halsman shot several rolls of film before he got just the right pose and position. Each time the dancer leaped, Halsman caught him at the peak–when he stopped going up, but hadn't started to come down. The low camera angle placed the dancer "above" the aircraft in the background. Notice how the outstretched arms make a V that is repeated by the angle of the legs and body, and picked up again by the V-shaped tail assembly of the aircraft.
[Courtesy *The Saturday Evening Post,* ©1962, The Curtis Publishing Co.]

Using motion streaks and blurs

You first need to learn how to avoid motion blur in your pictures. Practice photographing subjects in normal motion–people walking and moving about–until you can "stop" the movement. Use the faster shutter speeds of your camera, and apply the principles we gave you about avoiding close-ups and trying to catch action head on or at an angle. Then you can try stopping faster action–sports, children playing, moving vehicles, etc. The techniques of panning and catching peak action may help you here.

However, experiment with the effects that *slow* shutter speeds can give you, too. Try recording motion as streaks and blurs.

Some members of your Guiding Faculty use motion blur in their work–both on professional assignments and for personal expression. Others prefer to maintain image sharpness. The important thing is for you to understand the visual effects that can be achieved by both methods. Motion blur–as with other types of image unsharpness–should be the result of control and choice, not carelessness or accident.

Here are two unconventional pictures by Richard Avedon and Irving Penn that break the usually accepted rules in order to create an effect the photographer desired.

Moving your camera

When Richard Avedon began photographing Louis Armstrong for his book of portraits, *Observations*, he made several pictures using a shutter speed that would stop the action. But as Armstrong began to play [accompanying his own music on a record player], Avedon changed to 1/25 second and began to jiggle his twin-lens reflex up and down each time he made an exposure "to suggest the beat and quality of jazz music." Finally, when he took the picture shown here, he moved the camera jaggedly during the exposure to add even greater irregularity to the motion streaks. [If you look closely at the highlights in the trumpet, you can see the hook-shaped path the camera followed.]

Blurring the subject

See how Irving Penn reversed the rules for stopping motion to increase the blur in this photograph of two children crossing a white-walled street in Rabat, Morocco. That is, the children are running directly across his path. If he had shot them from an angle or head on, they would have been less blurred. He photographed them at a *close* distance and used a *slow* shutter speed [1/5 second].

"I treated the street as a stage," Penn says, "setting my camera on a tripod and prefocusing it. Then I induced the two children to pass by in front of my lens." The blurred, moving human images contrast interestingly with the rigid, geometrical design elements of the walls and archways in the background.

[Courtesy *Vogue*, ©1952, Condé Nast Publications, Inc.]

Aperture + shutter speed = exposure

You've seen how the twin controls of shutter speed and aperture work together to regulate the total amount of light that falls on your film when you take a picture of a particular subject under a particular lighting condition. The shutter speed controls the *duration* of the light, and aperture controls its *brightness*. The *total* amount of light that acts on the film when you take a picture is the *exposure*.

It's important for you to understand thoroughly the combined effect of aperture and shutter speed on exposure, and to realize the importance of correct exposure itself. We'll cover this subject in enough detail in these pages to give you a basic working knowledge of these key matters. Again, we emphasize the need for you to *study* this information and learn to *apply* it in your own picture-taking. This is essential in order to insure your steady growth as a photographer.

Exposure–why it's important

Unless the correct amount of light acts on the film during the time you take a picture, you won't get a satisfactory negative when the film is developed. And without a good negative, making good prints and enlargements becomes difficult, if not impossible. Therefore, correct exposure is of basic importance.

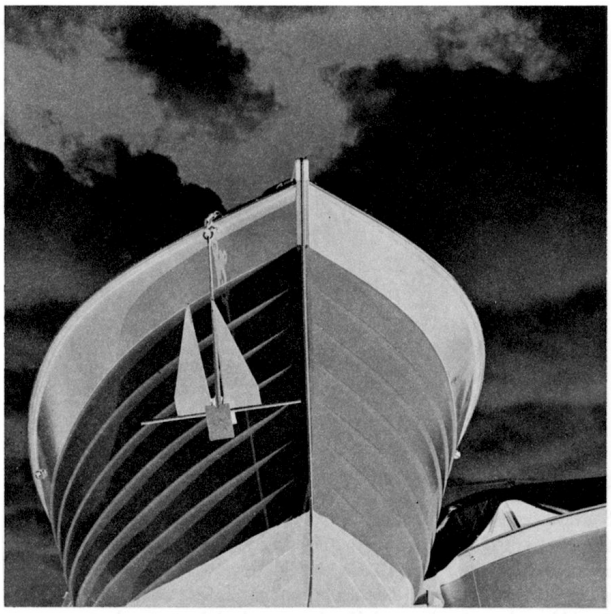
Different films vary in their sensitivity to light, and they require different amounts of exposure to produce the best results. You'll find information about the exposure requirements of the film you are using in the data sheet included with it. This data sheet will give a rating of the film's sensitivity to light. [This rating is called the film's *exposure index.*]

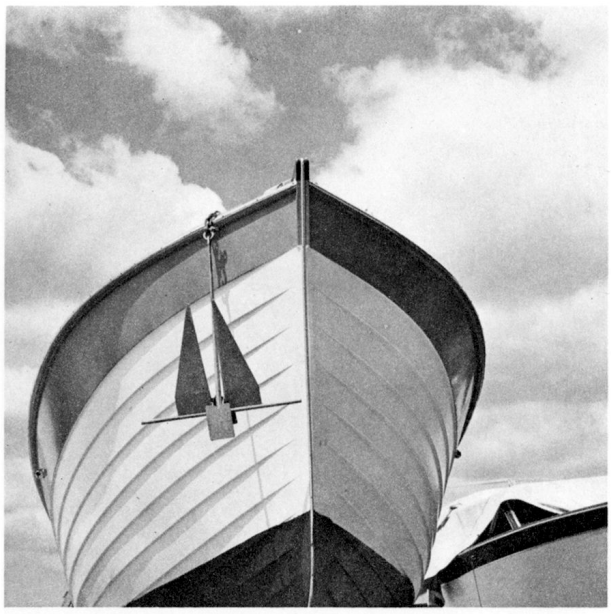
The data sheet also may include a chart giving shutter-speed and aperture combinations that will produce the correct exposure for different subjects and lighting conditions. Pocket-size exposure guides which give information about a variety of films also are available at camera stores. Follow the directions in these charts and guides for consistently good results in your shooting. [In Lesson 4 we'll cover the subject of exposure in detail, including how to use exposure meters.]

One useful fact to keep in mind is that each type of film requires a particular amount of exposure in every shot to produce a picture of the best possible quality. If the subject and lighting are bright, you may need to use a fast shutter speed, a small aperture, or a combination of both so that too much light doesn't fall on the film. On the other hand, if the subject is dark or the lighting is dim, you may need to use a slow shutter speed, a large aperture, or a combination of both to give the film sufficient exposure.

To see the effect of correct exposure, too little exposure, and too much exposure, study the three pairs of pictures reproduced here. For each effect, we've included both the negative and a print made from it. You may find it useful to compare your own prints and negatives with the examples we give. This will help you judge whether or not you've exposed correctly, given too much exposure, or not enough–and guide you in avoiding the error the next time you shoot.

Important: the exposure index and recommendations given in the data slip with your film are correct *only if the exposed film is developed properly, as in the manufacturer's recommendations,* or is given equivalent treatment with other brands of developers. If you already know how to develop your own film, be sure to follow the manufacturer's directions exactly. If you are having your films processed for you, use a reliable photofinisher who will give them careful, standard developing.

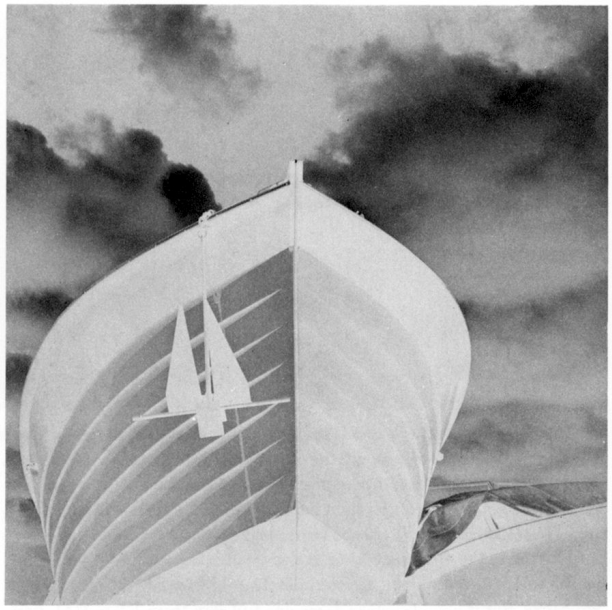




Normal exposure

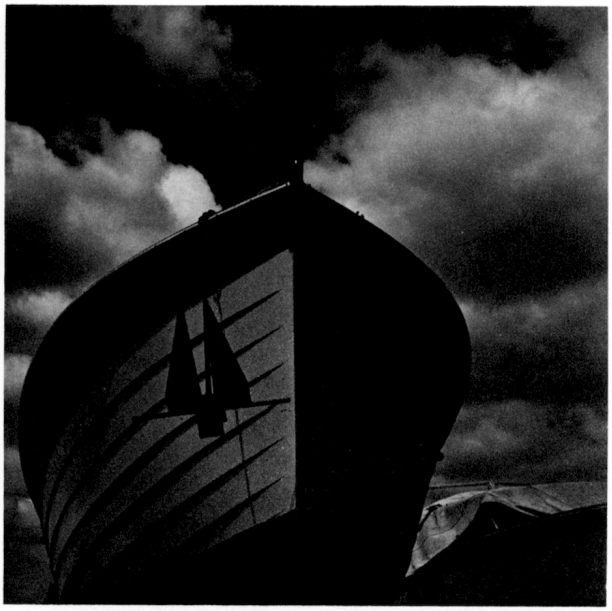
Compare these three sets of negatives and matching prints to see the importance of choosing a shutter-speed and aperture combination that gives correct exposure–neither too much light nor too little. This properly exposed negative has some clear areas, some black areas, and a wide range of intermediate tones.

The resulting print has a good range of tones, from black [the shadow under the canvas of the boat at lower right] through several shades of gray, to white in the clouds and sunlit areas of the white-painted hull. The overall brightness level and the relationship between light and dark tones appear "normal." That is, they look like what your eye might see on a bright, sunny day.

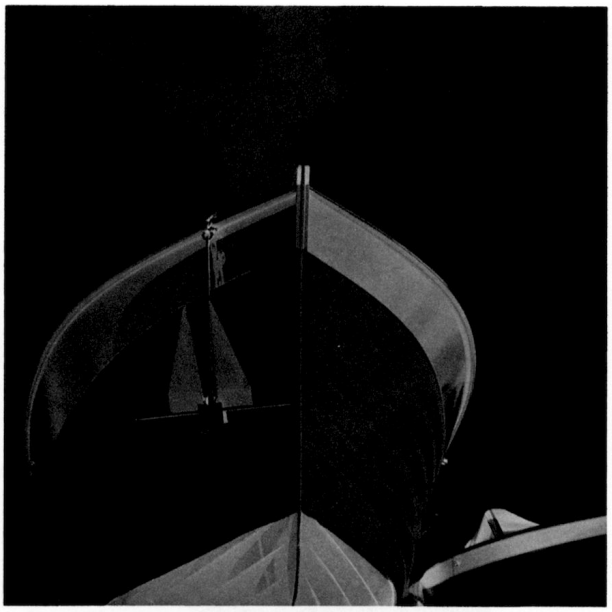


Underexposure

This negative didn't get enough light. [It was exposed on the same film as the normal negative, but exposure was reduced four stops.] Notice that it's lighter–"thinner"–than the correctly exposed one, lacks detail in shadow areas, and has large areas of clear or nearly clear film.

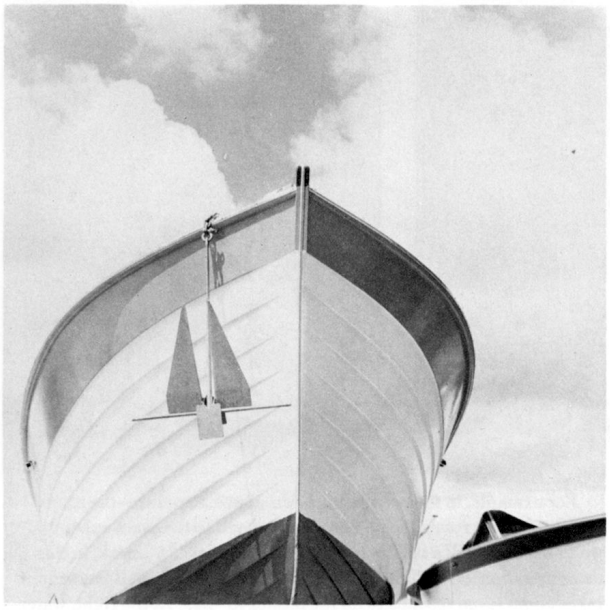


This print is much too dark and muddy. The details are lost in the black shadow areas, especially the shadow side of the hull. The anchor–gray in the normal print–is nearly black now. There are no pure whites, even in the sunlit clouds. This is how the scene might look if you viewed it through very dark sunglasses.



Overexposure

This negative got too much light–four stops more than correct. It's overly "dense"– black and heavy. Even if you held it up to a bright light, you wouldn't see much detail in it. Notice particularly how dark the bright sky-and-cloud area and the sunlit side of the boat have turned.



The print from the overexposed negative is far too light. The bright areas have "blocked up"–gone flat white and lost their detail. The clouds have lost most of their gray shadows, and the horizontal shadows on the sunlit side of the boat are barely visible. There is no area of strong black. The picture looks pale and washed out.

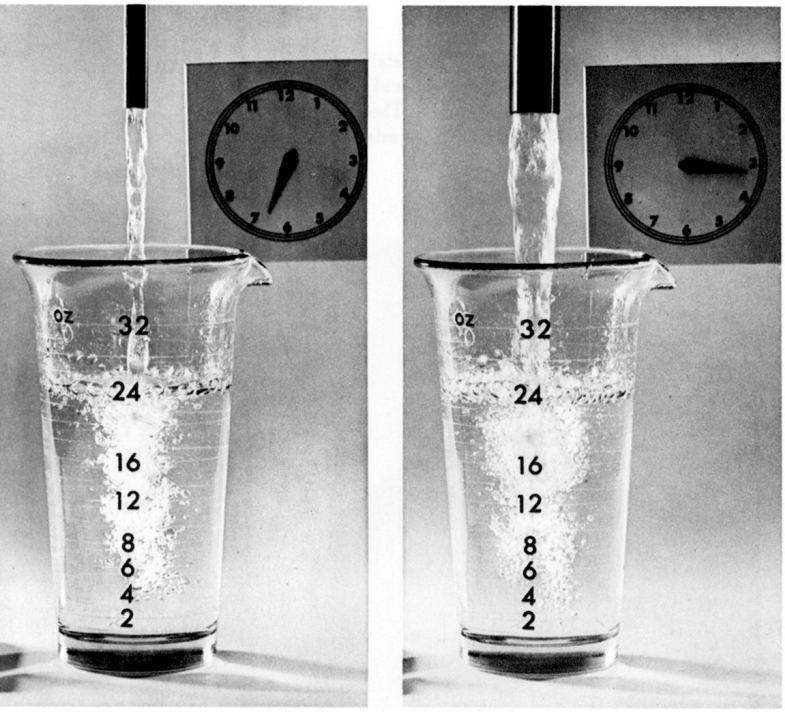
Choosing different shutter-speed and aperture combinations

Once you've established the correct amount of exposure that your film needs, you must choose a combination of aperture and shutter speed that will produce this exposure for the particular subject and lighting conditions at hand. Often, you'll have a choice of more than one combination.

To show the relationship between shutter speed, aperture, and exposure, let's make a simple analogy with a water faucet. The correct exposure for the particular film you are using can be compared with the exact amount of water needed to fill a container of a certain size. The camera's shutter speed can be compared with the length of time the faucet is turned on. The aperture can be compared with the mouth of the faucet, which determines the size of the stream of water.

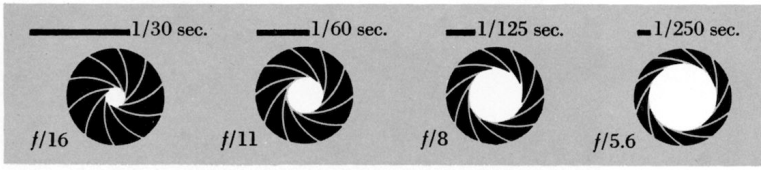
If the mouth of this faucet is large, you can fill up the container quickly. But if the faucet has a small opening, you'll need to let the water run for a longer time.

In a similar way, if you have a large aperture you can use a faster shutter speed to get the desired exposure. But with a small aperture you'll need to use a slower shutter speed to produce the same effect.



For example, in the two photographs above, exposure–the total amount of light reaching the film–is compared to the exact amount of water needed to fill a beaker to a certain level–the "24" mark, in this demonstration. At the left, the flow of water from the small faucet takes about seven seconds to fill the beaker to "24." At the right, water flowing from the large faucet fills the beaker to the same level in only three seconds. In a similar way, a combination of small aperture and slow shutter speed can produce the same exposure as a combination of large aperture and a fast shutter speed.

Let's look at some examples. Assume you're taking a picture in lighting conditions that require an exposure of 1/125-second shutter speed and an aperture of *f*/8 for the particular film you are using. The combinations of shutter speed and aperture shown in this diagram will all produce the same exposure; that is, will let the same amount of light reach the film.



You can easily see why this is so. If you change the shutter speed from 1/125 to 1/250 second, you cut the duration of the exposure in half. But if you also open up the aperture one full stop from *f*/8 to *f*/5.6, you double the brightness of the light admitted to the film. The two changes cancel each other out. Exposure remains the same.

Moving in the other direction, if you change the shutter speed from 1/125 to 1/60 second, you approximately double the duration of the exposure. But if you also close down one full stop from *f*/8 to *f*/11, you reduce the brightness of the admitted light by one half. Again, both changes cancel out, and exposure remains the same.

An easy way to keep this relationship clear when changing camera settings is to remember: "Faster shutter, larger aperture" and "slower shutter, smaller aperture."

Let's put these facts to work as you might use them while shooting a picture. Place your camera on the table in front of you and actually make the changes as we discuss them.

Set your camera at 1/125 second and *f*/8. Let's assume this gives correct exposure.

Same exposure, different visual effects

At 1/8 second and *f*/22, motion is extremely blurred, yet depth of field–indicated by the sharpness of the unmoving portions of the foreground figure and the distant beach umbrella–is great. [Photographs by Peter Gowland, courtesy *Popular Photography*]

Now let us say you want more depth of field than an aperture of *f*/8 gives, and you decide to stop down to *f*/16. Move the aperture control two full stops [from *f*/8 past *f*/11 to *f*/16]. This cuts the light to one fourth what it was. [One half of one half is one fourth.]

Remember–smaller aperture, slower shutter. So change the shutter speed control two settings–from 1/125 second past 1/60 to 1/30 second. This makes the exposure four times as long. It gives you the same exposure as the old setting [one fourth the brightness but four times as long], but with the smaller aperture you need for greater depth of field.

Now we'll consider another situation. Suppose you want to photograph a rapidly moving subject. You need a fast shutter speed to stop the motion. So let's say you move the shutter-speed control from 1/125 past 1/250 to 1/500 second. The duration of the exposure now will be only one fourth what it was. Remember, faster shutter, larger aperture. Open up the aperture two full stops, moving from the *f*/8 setting past *f*/5.6 to *f*/4. Each full stop doubles the brightness of the light admitted, so the intensity of light admitted at *f*/4 is four times as bright as previously. However, it remains on the film only one fourth as long. Again, exposure remains the same–but you have the fast shutter speed you want.

Practice setting different combinations that give the same exposure. Some cameras have "cross-coupled" aperture and shutter-speed controls that automatically change one control as you move the other in order to maintain the same exposure. However, we suggest that you bypass this aid and learn to make the calculations yourself. When actually taking pictures, you'll sometimes need to change aperture or shutter speed quickly while keeping exposure the same. Practice until you can do so without fumbling or stopping to puzzle out the correct relationship between your two basic controls.

Notice, in photography as in life, you can't have your cake and eat it, too. In choosing the faster shutter speed, you sacrifice some depth of field, and vice versa. It's up to you to decide, depending on the subject and the effect you want in the picture, whether to select the fastest shutter speed possible and stop action, or the smallest aperture for the greatest depth of field, or some compromise combination. With your knowledge of the different effects possible with aperture and shutter speed, and your increasing experience as a photographer, you'll soon find yourself making such decisions quickly and naturally.

The total range of choices you have for any particular shot will depend on several things: the film you're using, the subject, the lighting conditions, and the range of *f* stops and shutter speeds available on your camera.

Sometimes there won't be much choice. When shooting in dim light, for example, you may find that you need to open your lens wide and use the slowest shutter speed you dare to get enough light. In very bright sunlight, you may find that you need to stop all the way down and use the fastest shutter speed on your camera to give the correct exposure. But in less extreme situations, you will have a choice–often a wide one. And here the skill and knowledge you've acquired through your study of this lesson will help you make the best selection.

The three photographs below show how different visual effects can be created by different shutter-speed and aperture combinations while maintaining the same exposure. All three pictures were photographed on a medium-speed film. All have uniform exposure, but notice how depth of field and action-stopping effect vary greatly, depending on which combination of shutter speed and lens opening was used.

At 1/60 second and *f*/8, depth of field is somewhat less but the motion of the beach ball and figures is stopped more effectively.

At 1/500 second and *f*/2.8, depth of field is very narrow but all the action is stopped by the fast shutter. Determining proper exposure is only the first step toward getting the picture you want. Equally important is deciding which available combination of lens opening and shutter speed will best suit your purpose.

How to hold a camera

There's no one "right" way to hold a camera. It's a matter of common sense and personal choice. Much depends on the size and balance of your camera, as well as where the controls are located. The important thing is to work out a method that feels comfortable to *you,* and enables you to keep the camera absolutely steady at the instant of exposure. However, there are certain general pointers that every photographer should know.

First, it's essential to hold the camera securely. Get a firm, secure grip on it with both hands. Don't just use the tips of your fingers, but cradle the camera with your whole hand or as much of it as feels comfortable. Make sure no part of your finger or hand blocks the lens or viewfinder. Try to place your hands so that the shutter release and focusing controls are within easy reach.

Keep your elbows tucked in whenever possible and the camera pressed firmly against your face or body–but not so tightly that your muscles are tense. Try to make your arms, body, and camera a solid unit.

Moving the camera at the moment of exposure is a common cause of unsharpness. But with a little care and practice you can eliminate this problem. If you jab the shutter release, you may move the camera. It's *very important* to press it gently with a steady, squeezing action. Gradually contract the muscles of your hand and trigger finger until the release almost seems to trip itself. [Properly tripping a camera shutter is like firing a rifle, not flicking a light switch.]

Different shutter releases have different amounts of play or tension. Test yours [without film in the camera] to see how much slack needs to be taken up before the shutter trips. Make a habit of taking up this slack just before you're ready to shoot–then a slight additional squeeze will do the trick, with minimum danger of camera shake.

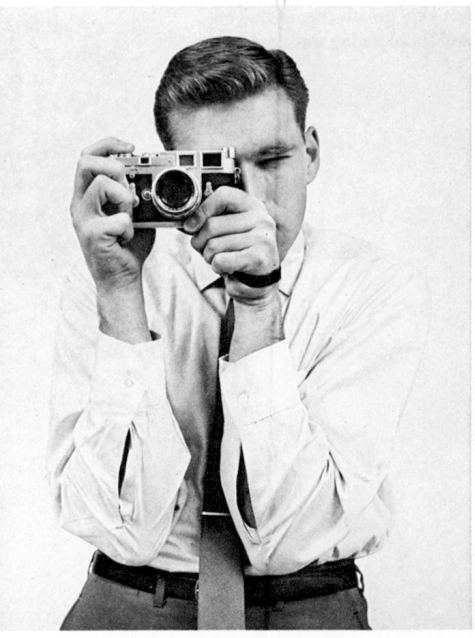
Breath control can help improve your steadiness. Inhale, let out a little breath, shoot, then exhale all the way.

A neckstrap should be attached directly to the camera body, if possible, not to the carrying case. Then you have use of the strap as a brace for extra steadiness even when the camera's out of its case. And we do recommend that you remove the case when shooting. The front flap has a bad habit of flopping in front of the lens at critical moments, and you'll lose valuable–perhaps irretrievable–time if you have to remove the camera from the case every time you reload.

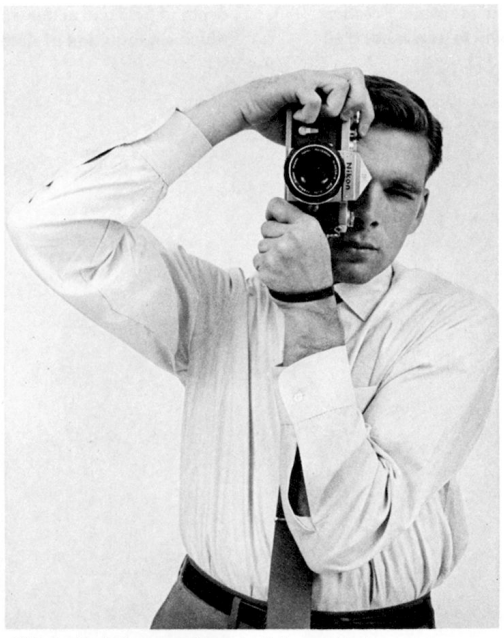
Study the camera-holding demonstrations with different camera types on these and the next two pages. You can easily adapt the methods you see to your own particular equipment.

Careless, unsteady holding of your camera can result in wasted film and poor picture quality. Therefore, don't take the way you hold your camera for granted, but learn the best way–for *you*–to hold it steady and handle its controls quickly.

35-mm camera



For horizontal shooting, both elbows are tucked in. Your left hand presses the camera against your face. Your right hand supports the camera, with forefinger free to operate the shutter release.



This is the "elbow out" method for vertical shooting. Your left arm and hand support the camera and press it against your face. The right hand is free to work the shutter release.

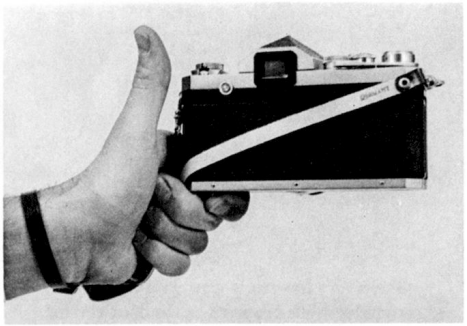
The "elbows in" method for verticals is preferred by some photographers as steadier. Here, your right thumb presses the shutter release, your left hand moves the focusing control.

Stand this way

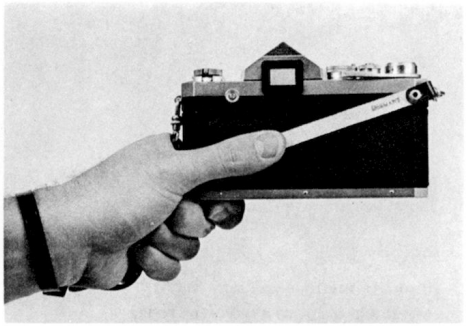
In this front and side view we show you a good stance for taking pictures, whether at eye or waist level. Keep your knees slightly bent, your legs slightly apart–with one leg advanced. Distribute your weight evenly on both feet. This position gives maximum steadiness front to back as well as from side to side. When you follow a moving subject with your viewfinder, rotate your body at the hips.

These photographs also demonstrate a good way to use a neckstrap for added steadiness. Thrust your hands between the two sides of the strap, grasp your camera in the usual way, and raise it to eye-level position. If the strap length is correctly adjusted, a slight outward pressure of your hands will press the camera more firmly against your face.

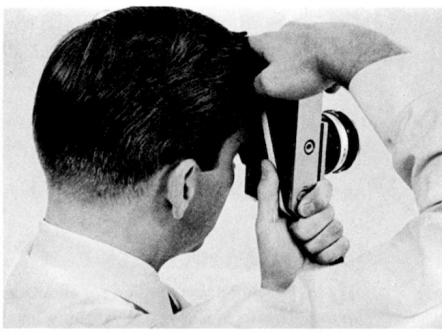
Another way to use the neckstrap



1 Loop the strap around your left wrist and gather up the slack in the palm of your left hand. The strap should be pulled taut across the back of the camera, as shown.



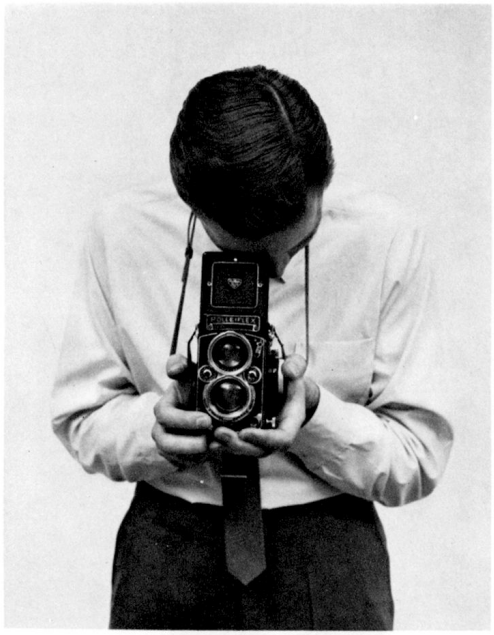
2 Now place your thumb on the strap to anchor it securely in position.



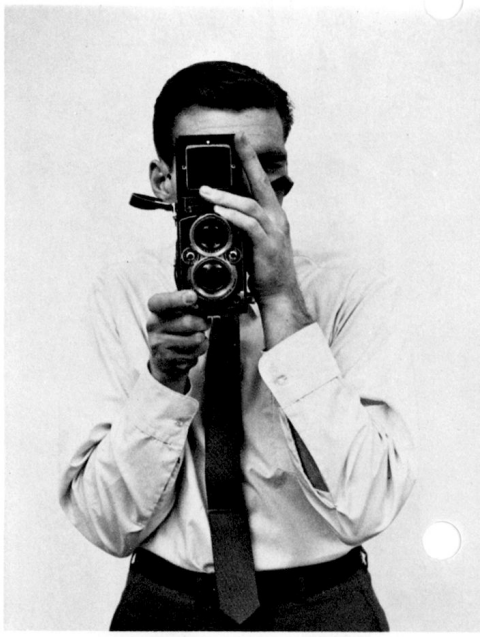
3 Raise the camera to shooting position, vertical as shown here, or horizontal. Keep the strap taut so it acts as a brace, giving you additional steadiness. Use your right hand to press the shutter release.

Twin-lens reflex camera

Here's the standard position for holding a twin-lens reflex for waist-level shooting. You adjust the neckstrap so it's tight enough to give the camera good support. Use your left hand to work the focusing control, your right hand to trip the shutter. [Since this type of camera produces 2 1/4 x 2 1/4 *square* pictures, it makes no difference whether you hold it vertically or horizontally.]



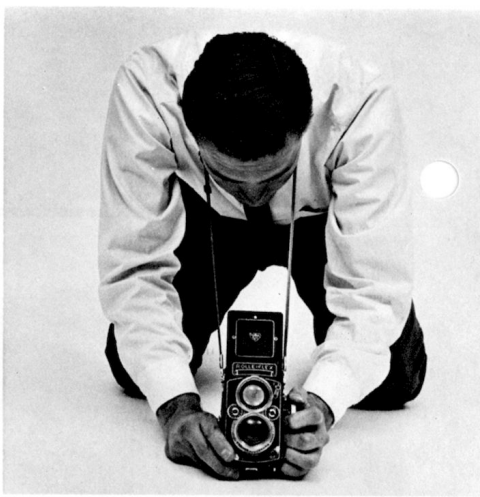
For extra-fine focusing, most models have a magnifier that can be raised into position above the viewing screen. To use the magnifier, hold the camera close to your eye. You can hook your thumbs through the neckstrap as shown here to take up the slack, and shoot from this position.



Most twin-lens cameras also provide some kind of eye-level peepsight finder. This often is useful when you're shooting a moving subject. Keep your elbows well tucked in and press the camera firmly against your face.

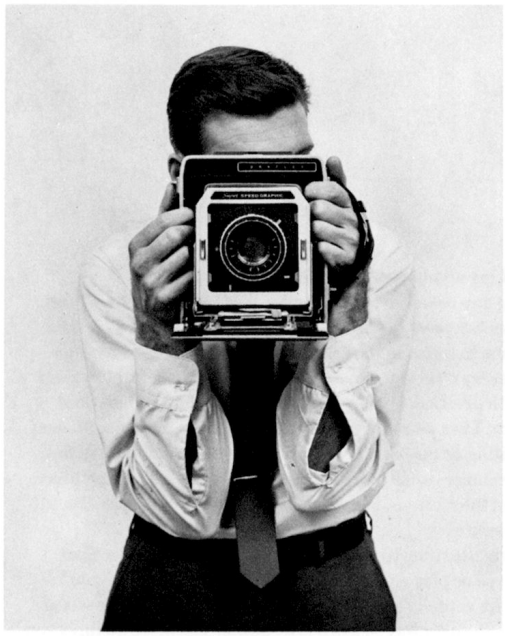
Try this upside-down method for shooting over the heads of a crowd. By pulling firmly against the neckstrap you can exert enough pressure to hold the camera reasonably steady, and by looking up into the viewing screen you can see what you're getting.

In some situations you may find it convenient to brace a twin-lens reflex against the wall like this to minimize the danger of camera shake. Of course, any other kind of hand-held camera sometimes can be braced against a firm support such as a table, wall, chair back, windowsill, or fence post for this same purpose.

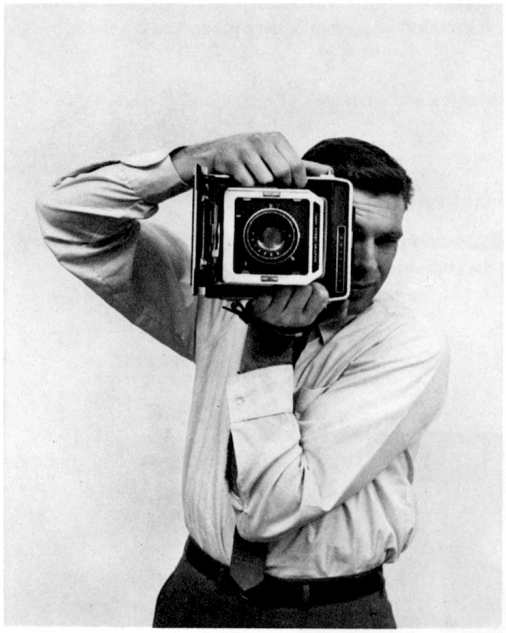


For a very low-angle view, you can rest a twin-lens reflex camera on the floor and tilt it up slightly. This can be especially useful when photographing small children or pets.

Press camera



For horizontal shooting with a press camera, grasp your camera securely with both hands on the side of the box with your left hand under the strap. Keep your elbows against your stomach so that your arms will act as angle braces to support the weight of your camera. And remember the pointers about how to stand, so that your weight will be distributed evenly and you won't tend to sway.



For vertical shooting, balance the camera on your left arm and press it snugly against your face. Raise your right arm and elbow high enough so that you can easily reach the shutter release.

Tips on camera care

Your camera is a precision instrument–treat it like one and it will give you years of reliable service. Obviously, you should be careful not to drop it or subject it to severe bumps. Here are some other common-sense tips for keeping it in first-rate condition:

Don't store a camera in the glove compartment of your car. Excessive heat may injure the lens and film.

Don't leave the shutter cocked when storing the camera over a long period of time. Prolonged tension may weaken the spring. If necessary, waste a frame and trip the shutter to release the tension.

Don't touch the lens with your fingers. This leaves marks that can impair the performance of the lens, and the acids in the moisture from your skin can harm the lens surface.

Don't attempt to make camera repairs yourself–that's a job for a trained specialist.

Do keep your lens clean. It has a delicate surface which scratches easily, so handle it with care. First remove loose dust or particles by gently blowing on the lens or brushing it with a clean, dry sable brush. Then breathe on the lens and gently rub its surfaces with a piece of photographic lens tissue or soft, clean, lintless cloth. Avoid linen handkerchiefs [they tend to scratch], ordinary facial tissue [it tends to shred], and silicone eyeglass tissue [it can damage the extremely thin reflection coating found on most modern lenses].

Do protect the camera and the lens from dust, grit, sand, rain–and especially salt spray. If your camera gets wet, dry it off immediately. If sand or dust gets inside, blow it out with a small ear syringe.

Do replace the lens cap when your camera is not in use.

Do store your camera in a cool, dry, clean place. For prolonged storage, it's a good idea to place the camera inside a plastic sandwich bag with a small packet of silica gel dehumidifying crystals.

And, when loading your camera, remember

First, and most important, *follow the directions in your camera manual.* Be sure that film spools or 35-mm film cartridges are firmly and properly seated. [With roll films, don't break the seal until you've placed the roll in position.]

Make certain that the light-sensitive, emulsion side of the film faces the lens. [This happens when the black side of a roll film's paper leader or the dull, cream-colored side of 35-mm film faces the lens.] And remember, film tends to curl towards the emulsion side.

After attaching the film to the take-up spool, give a turn or two to be sure the film is securely fastened and running straight across the grooves provided for it. With 35-mm film, be sure that the perforations are engaged in the sprockets exactly as the instruction manual indicates. Roll film or 35-mm film that runs crooked may jam your camera or suffer crumpled edges.

Does your camera have an exposure counter that needs to be set? A film reminder to indicate the kind of film you're loaded with? [It's easy to forget the kind of film if you don't finish the roll at one shooting.] Are you certain you put the back of the camera on securely, with no light leaks, and *locked* it?

When you advance the film, see if the rewind knob turns. If it doesn't, your film may have slipped off the take-up spool.

And of course, never load or unload film in strong, direct light. Outdoors, if you can't find a spot of shade, shield the camera with the shadow from your own body.

The importance of knowing your camera

Any camera, no matter how intricate or expensively made, is a lifeless object of glass and metal–until it is in your hands. Then, if you handle it with knowledge and skill, it becomes an extension of *you*–expressing your personality, your artistic taste, and creative insight. It becomes a wonderfully sensitive and responsive servant, giving you the power to capture any moment in time, or to create a unique and memorable picture of any person, object, place, or event you wish.

But, to be the master of your camera, you first must thoroughly understand its capabilities and its limitations, and know how to set its various controls to produce the results you want.

This is why the lesson you have just read is one of the most important in your entire Course. The knowledge you gain here is indispensable. You will use it throughout the lessons to come. Your success in learning and using advanced techniques and your development as a creative photographer will depend in large measure on how well you master the principles of camera handling demonstrated here.

Therefore, study this lesson carefully until you are sure you understand the ideas, the definitions of terms, and the working methods explained in these pages. Do the practice and lesson assignments carefully. As a result of this study and practice–and before you go on to more advanced methods–you should be able to:

Quickly locate all the important parts and controls on your camera–and understand what each does.

Hand-hold your camera steady enough to take pictures at normal shutter speeds.

Use your viewfinder to frame the scene effectively.

Focus quickly and accurately.

Increase or decrease the range of sharpness in your pictures by changing the aperture.

Stop a normal amount of subject motion by using a fast shutter speed.

Change from one shutter speed and aperture combination to another without changing exposure.

These are the minimum skills you need to handle a camera. At first the various movements may seem awkward and unfamiliar. This is only natural if you haven't used a camera much before. But with a little practice you should soon feel completely at home with it. Eventually you'll be able to manipulate the controls, to aim, focus, and shoot without thinking about each separate movement consciously.

Acquiring any new skill takes practice. For example, if you ever learned to touch-type or to play a piano, you had to spend a certain amount of time in learning the finger movements. You had to *think* consciously every time you moved a finger to strike a certain letter or note. But, with practice, hitting the right keys became automatic–second nature. Then you were free to concentrate on the sense of what you were writing or the sound of the tune you were playing. It's the same with a camera–when you become skilled enough you won't have to think about the motions, but will be able to devote full attention to getting the picture.

Fortunately, learning to handle a camera is much simpler than learning to type or play a piano. And practice is fun because you combine it with actually taking pictures. Here, as in other aspects of photography, the only way to learn is by *doing*. The more pictures you take, applying the good working methods demonstrated in this lesson, the sooner you will achieve the self-confidence and the rich rewards that come with mastery of your camera.

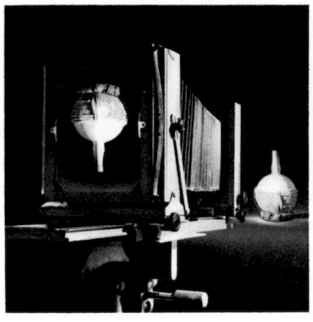
Remember SAFE-T

To increase your speed and accuracy, follow the same sequence of motions each time you take a picture. Then the motions will quickly become habitual, and you'll reduce the chance of forgetting one of the steps.

The best sequence may vary in detail, depending on the design of your camera. But the following step-by-step procedure is a sound basic guide:

Set [*shutter speed and aperture*]
Aim
Focus
Expose
Turn [*to next frame*]

Put the initial letters together and they spell "SAFE-T"–an easy way to remember the sequence.



Technical notes on the photographs

Page 8
Joseph Costa; 5x7 Graflex with 1000-mm lens; Super Panchro-Press, Type B film; 1/700 second at *f*/8; daylight.

Page 8
Richard Beattie; Brooks-Plaubel Veriwide with a wide-angle 47-mm *f*/8 lens; Plus-X film; 1/50 second at *f*/11; daylight.

Page 9
Alfred Eisenstaedt; Leica M-3 with a 28-mm wide-angle lens; Tri-X film; 1/5 second at *f*/2.8, with the camera on a tripod; available light.

Page 9
Alfred Eisenstaedt; Leica with a Visoflex reflex housing and a 135-mm lens; Plus-X film; 1/10 second at *f*/5.6; window light.

Page 12
Irving Penn; 8x10 Deardorff with a 12-inch *f*/6.8 lens; Super-XX film; 1 second at *f*/11; lighting from a panel of 800-watt bulbs behind a spun-glass diffusion screen.

Page 13
Alfred Eisenstaedt; Leica with a 35-mm lens; Super-XX film; 1/30 second at *f*/4.5; available light.

Page 13
Bert Stern; Hasselblad 1000F with a 180-mm lens; medium-speed film; 1/25 second at *f*/8; daylight from a studio skylight.

Page 13
Harry Garfield; Rolleiflex with a 75-mm *f*/3.5 lens; Plus-X film; 1/25 second at *f*/8; 2 floodlights, 2 spotlights.

Page 22
Arthur d'Arazien; 8x10 Deardorff with a 10-inch wide-angle lens; Ektachrome Daylight Type film; 1/50 second at *f*/16; daylight.

Page 23
Ezra Stoller; 8x10 view camera with a 200-mm lens; medium-speed film; 5 seconds at *f*/32, with the camera on a tripod; available light.

Page 23
Alfred Eisenstaedt; Leica with a 35-mm lens; Plus-X film; 1/10 second at *f*/8, with the camera on a tripod; available light.

Page 24
Bert Stern; Hasselblad with a 180-mm lens; Ektachrome Daylight Type film; 2 seconds at *f*/16; sunset light.

Page 24
Richard Avedon; 8x10 view camera with a 12-inch *f*/4.5 lens; Tri-X film; 1/25 second at *f*/4.5; mixed available light, spotlights, and floodlights.

Page 25
Alfred Eisenstaedt; Leica with a 135-mm lens; Tri-X film; 1/10 second at *f*/4.5, with the camera on a tripod; daylight from a studio skylight.

Page 31
Alfred Eisenstaedt; Pentax with a 180-mm *f*/2.8 lens; Tri-X film; 1/30 second at *f*/2.8; available light.

Page 31
Joseph Costa; 4x5 Speed Graphic with a 135-mm *f*/4 lens; medium-speed film; exposure for electronic flash between *f*/11 and *f*/16; electronic flash.

Page 32
Philippe Halsman; Rolleiflex with a 75-mm *f*/3.5 lens; Plus-X film; 1/400 second at *f*/5.6; daylight.

Page 33
Richard Avedon; Rolleiflex with a 75-mm *f*/3.5 lens; Plus-X film; 1/25 second at *f*/8; floodlights.

Page 33
Irving Penn; Rolleiflex with a 75-mm *f*/3.5 lens; Verichrome Panchromatic film; 1/5 second at *f*/22; daylight.

Famous Photographers Course
Famous Photographers School, Inc., Westport, Connecticut

Guiding Faculty
Richard Avedon
Richard Beattie
Joseph Costa
Arthur d'Arazien
Alfred Eisenstaedt
Harry Garfield
Philippe Halsman
Irving Penn
Bert Stern
Ezra Stoller

Lesson

3

Composing your photographs

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5 You compose on your viewfinder
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8 Picture area
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28 Depth
32 Backgrounds
34 Compositions for study
40 Practicing composition

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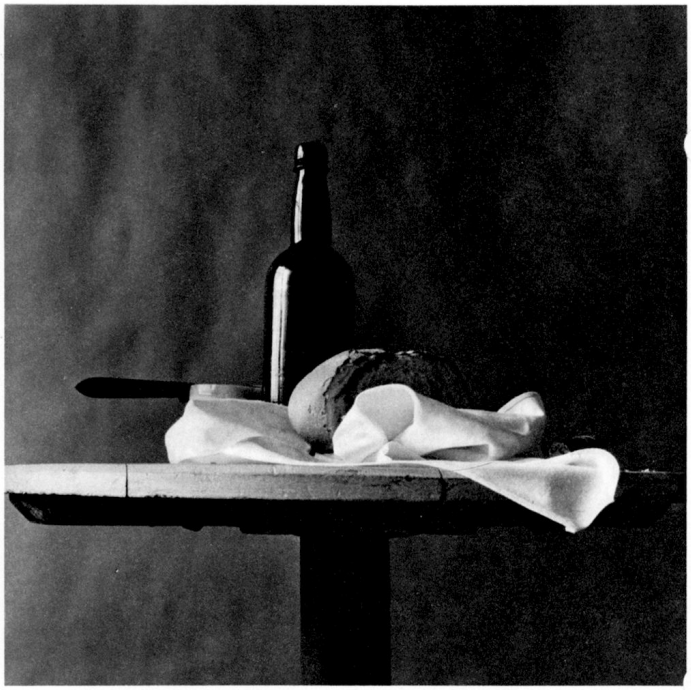
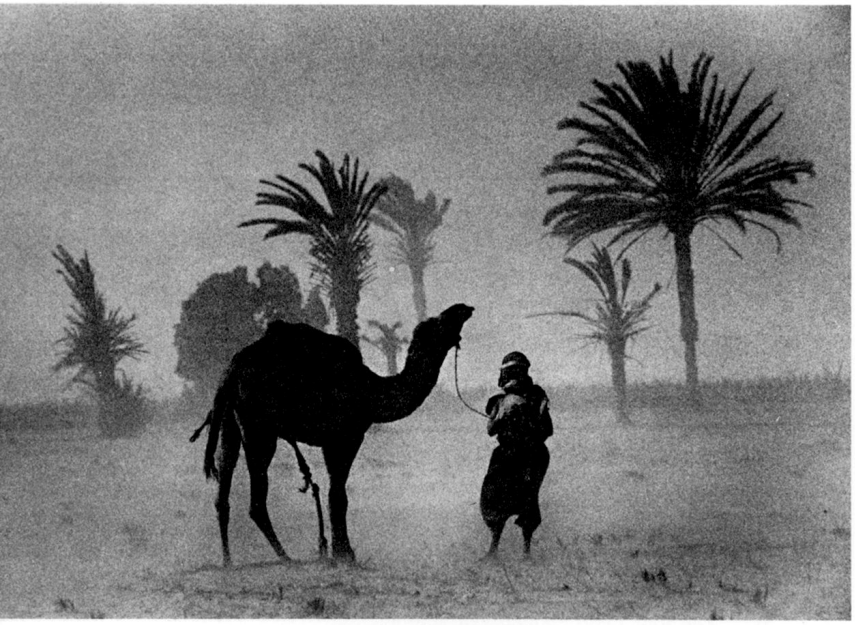
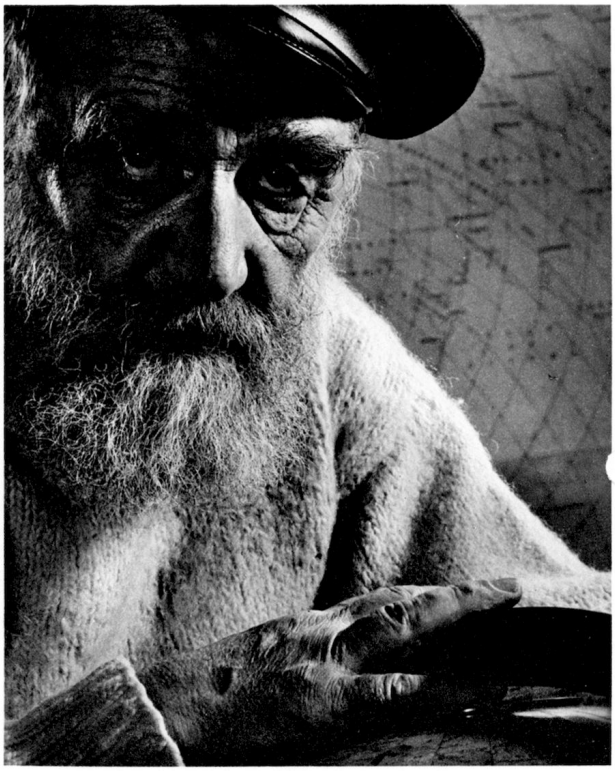






No matter what the subject of your picture may be—a still life, a person, a landscape, a news event, or anything else—its success or failure may well hinge on how you compose it. Each of the Faculty pictures on this page delivers its message clearly and vividly because of the knowledgeable way the photographer applied the principles of composition which you will learn in this lesson.
[*Top left:* courtesy *Harper's Bazaar*]
[*Center left:* courtesy *Vogue*, ©1953, Les Editions Condé Nast]

The importance of composition

Composition is the selection and arrangement of your picture elements–shapes, lines, tones, and colors–within the picture area in an orderly, purposeful manner. It is the art of *simplifying* and *organizing* so that your photographs communicate to the viewer clearly and effectively. A well-organized picture is more pleasing and satisfying to look at than a poorly composed, disorganized one, and it is easier to understand. Also, *the composition itself* can help evoke an emotional response from the viewer–a response that can intensify the reaction he has to your picture's subject matter.

To see what we mean, look at the pictures on the facing page. The photo of the skaters, by Richard Avedon, creates a strong feeling of gaiety, freedom, and swift movement. There is nothing accidental about this. The irregular, exciting shapes, the sharp contrast of dark against light, and the strong diagonal lines all help to produce this compositional effect. By shooting up almost from pavement level, the photographer shows the active shapes and lines of the two figures very clearly against the bare sky–and still manages to include enough background to suggest that this is Paris.

Contrast this lively, animated shot with the quiet dignity of the still life next to it, by Bert Stern. Vertical and horizontal lines dominate here–lines that we associate with rest, stability, and calm. The composition and lighting combine to create an impression of simplicity and beauty.

The care with which Philippe Halsman planned his photograph of Peter Freuchen makes it an eloquent, revealing portrait of a great old man. Halsman emphasized Freuchen's intense look, his craggy, weatherbeaten features, and worn hand–and reminds us of his career as a sea captain and explorer by showing part of his globe, chart, sweater, and cap. Irving Penn's picture of the camel and Arab enveloped in the choking grayness of a sandstorm and Richard Avedon's realistic portrait of an Italian woman's sad, powerful face owe much, too, to their creators' skill in controlling composition.

If you master the simple fundamentals taught here you should find yourself off on a good start toward achieving pictures like these. The ability to compose your photographs effectively is indispensable for expressing yourself in photographs–for creating pictures that convey meaning, moods, thoughts, or stories, rather than producing mere snapshots.

Composition and purpose

Good composition is functional–that is, it serves a very specific practical purpose. This purpose, simply put, is to *help communicate the picture's meaning as effectively as possible.* Every photograph you take should have its reason for being–a story to tell, a fact to report, a mood or emotion to evoke, an insight to give, a relationship to reveal. In composing, you should select and emphasize the things that aid in getting your idea across to the viewer, and subordinate or discard those which may distract and confuse.

No matter what the subject of your photograph, be clear in your mind about what you want it to convey. Ask yourself: "What things must I include in the picture so that the viewer will understand it quickly? What is important–and what is not?" Then, play up those elements of your photograph which will help it to be effective. Make important objects or details bigger or get them in sharper focus; light them more strongly or place them in an eye-catching part of the picture. Make less important objects smaller or less distinct; subdue their lighting or locate them in a less prominent position.

Using this approach, you can establish a strong *center of interest*–one detail or area that is the most important thing in the picture, and that will instantly attract and hold the viewer's attention. Most good pictures, no matter what the subject, have one dominant center of interest. If there is more than one, the viewer's attention may be pulled in different directions simultaneously; the picture may seem confused and the composition tend to fall apart. One of the most valuable things we'll show you in this lesson is how to strengthen the center of interest in your pictures.

In photography, there are several ways to control composition in order to achieve the results we have just mentioned. In some situations you can *physically arrange the subject.* You can direct a person to take a certain pose, you can add props, construct a set, move various objects around, and adjust the lighting until you get the effect you want. A second important control is the *camera viewpoint* or position you choose. You may move close to the subject or back away, select a high angle or a low angle, shoot from the front, left, right, or even from behind. The *focal length of the lens* you use also can have a significant effect on composition, since it enables you to include more or less of a subject. Of crucial importance in photographing a moving or changing subject is your choice of the *instant of exposure.* Finally, in the *darkroom,* when you're printing or enlarging, you have another chance to alter the picture's composition by cropping or leaving out confusing or unimportant details, by making all or part of the picture darker or lighter, or changing it in other ways. By applying one or more of these controls a creative photographer can achieve clear, powerful, well-organized pictures.

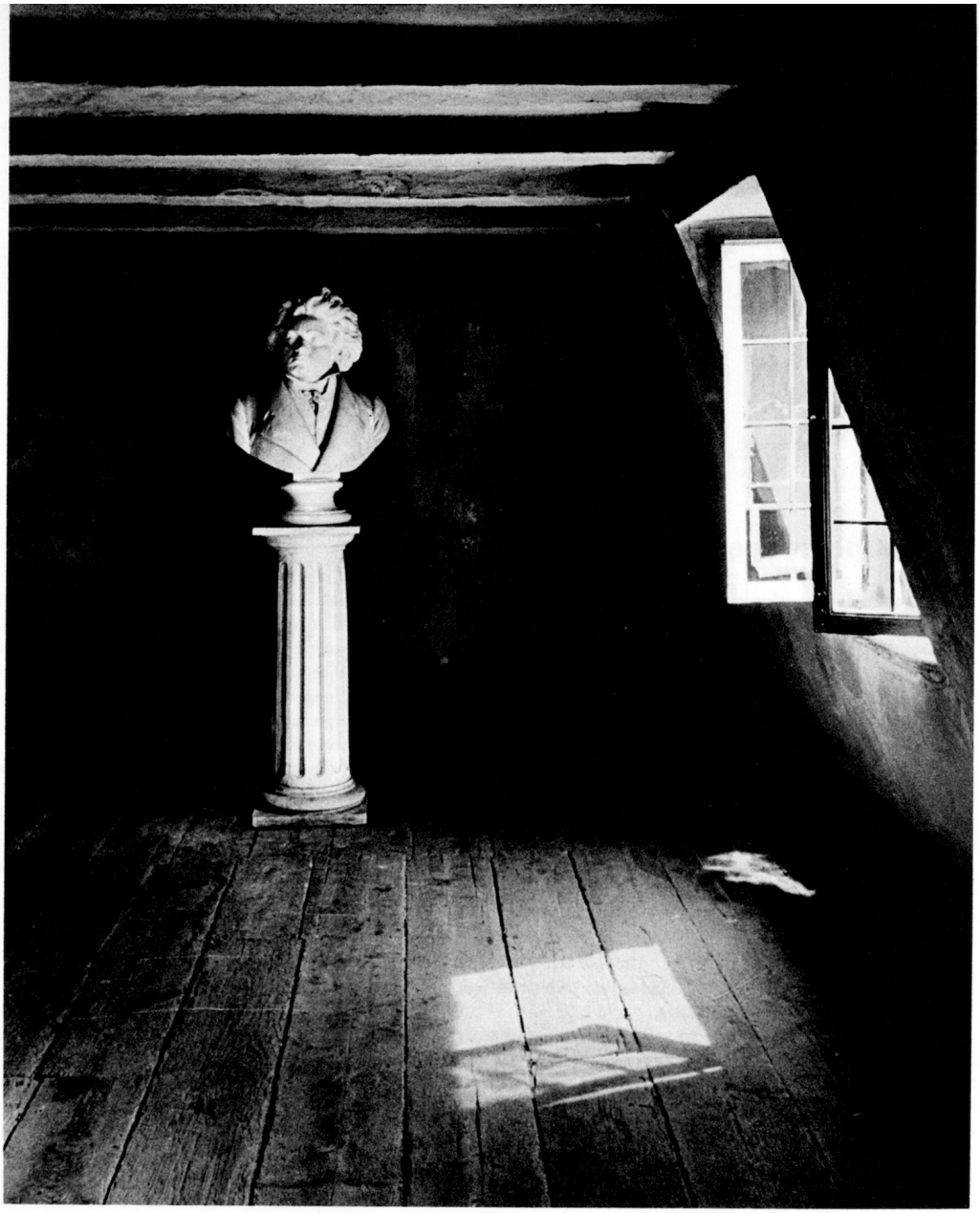
Composition and common sense

Composition sometimes is discussed as if it were a highly mysterious subject–something that you can only feel or sense, but can't be taught. On the other hand, it sometimes is treated as a collection of hard-and-fast rules that you can mechanically apply to every situation.

Our approach, based on the long practical experience and artistic insights of your Guiding Faculty and instructors who have successfully taught composition to thousands of students, is different from either of these extremes.

We have found that, given a normal amount of intelligence and ability, anyone can learn to compose effective photographs. It's largely a matter of knowing how to organize the various picture elements in a clear, interesting way. There are basic principles of arranging and organizing picture elements, and in this lesson we will demonstrate them to you in detail.

Importance of composition
[*continued*]



For an example of excellent composition, study this photograph of Beethoven's bust, taken by Alfred Eisenstaedt at Bonn, Germany, in the house where the composer was born. Notice that the bust was placed so that it stands out boldly against the black shadows and dominates the scene. Only essential details are included, and they all work together to make us feel, as the photographer must have felt, the living presence of the composer haunting this room.
[Courtesy *Life* magazine, ©Time, Inc.]

These basic principles of composition, however, are not rules or laws. They are simply guides to help you arrive at the results you want. Most of these principles are based on our common-sense experiences with the natural world–our sense of balance, of weight, or what is "up" and what is "down." Some of the principles stem from the interesting ways our eyes and brain tend to reveal the physical world to us–the way we see shapes, judge size, and experience the third dimension or depth.

It's up to you to apply these principles, in your own way and for your own purposes. Composition is something you will be concerned with every time you take a picture, not only for the rest of this Course, but throughout your personal or professional career as a photographer. From the standpoint of creative photography, this lesson is perhaps the most important in your entire Course. Refer back to it frequently until the principles explained here are firmly embedded in your mind. Once you've learned these principles thoroughly, and know how to apply them skillfully, you will be able to give sharper, clearer expression to your photographic ideas. In composition you will find a tool that can raise your pictures from the level of the ordinary to that of unique and vivid communication.

Here's how the picture was first seen in the viewfinder: This is an interesting subject, but the composition has some obvious weaknesses. Because we tilted the camera up a little too much, the feet of the boy and dog are cut off at the bottom. Also, the boy and dog are too far to the left, giving us a large meaningless area of white at the right. The picture looks lopsided.

And here's how the composition was improved: We lowered the camera angle a little to restore the cut-off feet and include a portion of the rock the boy is standing on. Also, we turned the camera to the left to improve the position of the boy and dog. The picture is better balanced now and shows us details that establish the outdoor surroundings. [Courtesy Southern Bell Telephone & Telegraph Co.]

You compose on your viewfinder

Although it may come as a surprise to you, you've been composing as long as you've been taking pictures. Each time you look at your subject in the viewfinder or groundglass and then move one way or another to get a better view, you're working at improving the composition. Your viewfinder or groundglass is simply the frame in which you visualize each composition. Use it to try various arrangements until you arrive at the one which best suits your purpose. The illustrations above give a graphic demonstration of what we mean.

It's difficult, without long practice, to judge a composition directly by eye, without the aid of a viewfinder or groundglass. First, your eye is a "wide-angle lens" and usually takes in too much. By contrast, a good viewfinder shows you only what the camera sees and cuts off the rest. Its four borders clearly indicate the picture area within which you must compose.

Second, we see things as three-dimensional forms existing in depth, and sometimes it is hard to visualize what they will look like in a flat, two-dimensional print. A camera viewing system, by putting your subject on a flat surface, can help you visualize the final picture more accurately.

Of course, in black-and-white photography, you also must train yourself to imagine how a subject in color will look when recorded in black, white, and various shades of gray. A viewfinder can't show this to you. You may also need to imagine what objects will be sharply focused and what ones will be out of focus.

When using a viewfinder, there's an important thing to keep in mind. You see things *selectively*. That is, your attention concentrates on just a few things at a time. Your eye–and mind–tend to ignore unimportant or uninteresting details. In effect, you see mainly what you want to see.

A camera, however, sees *unselectively*. It records everything within its field of view, the trivial and distracting as well as the important. It is an objective, nonhuman observer. It is you, the photographer, who must add the human element–guide the camera and make it record only those things which are important to your picture idea. You must do the selecting and organizing.

It's a common experience to discover on your print things you didn't see at the time you took the picture. Therefore, examine the *entire picture area* shown by your viewfinding system. Study the top and bottom, the right and left edges, and all four corners, as well as the central area. Look carefully at the background. Really *look!*

Here are some simple but important things you should train yourself to check automatically each time you shoot a picture:

Is the horizon line level?

Are you including unwanted or distracting details?

Are tree branches, bushes, or other objects apparently growing out of people's heads?

Is the principal subject clearly defined and separated from the background?

Have you corrected for any parallax error?

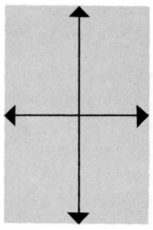
Your viewfinder is one of the most valuable parts of your camera. Be sure to give the image which you see in the viewfinder the intensive scrutiny we've recommended here. The professional photographer does this with every picture he makes, for a very simple reason–he has learned by hard experience that the viewfinder provides the best way to judge the picture before he snaps the shutter.

The four main elements of composition

To make your study of composition as simple as possible, we have divided the subject into four basic elements–*picture area, value, lines of direction,* and *depth.* Here we show you what these elements mean and how Alfred Eisenstaedt uses them in one of his photographs. Then we go on to explain and demonstrate each element in detail.

At the start, you will probably need to think consciously and deliberately about each of these elements in planning your pictures. With experience, however, you should find yourself composing as your Faculty members do–instinctively applying the principles of picture area, value, lines of direction, and depth all at the same time whenever you look into your viewfinder.

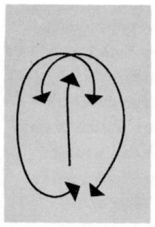
[Courtesy *Life* magazine, ©Time, Inc.]



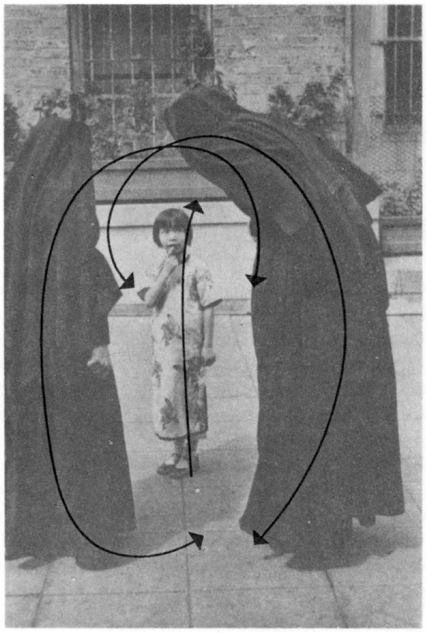
Picture area

Picture area is the flat surface bounded by the four edges of your viewfinder–the area within which you arrange the shapes that make up your picture. In using picture area, important things to consider are the *size* of objects, *where* you place them, and how they *balance* one another.

Notice here how effectively the photographer used the picture area. The child–the picture's center of interest–attracts our attention at once because she is facing us and because she is in a prominent position close to the middle of the picture area. The large figures of the nuns are arranged as a strong frame that concentrates attention on the child. The forms are well balanced, too. They fill the picture area comfortably, so that there is no feeling of empty, wasted space, yet things don't look uncomfortably crowded.



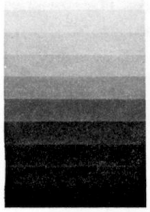
Lines of direction



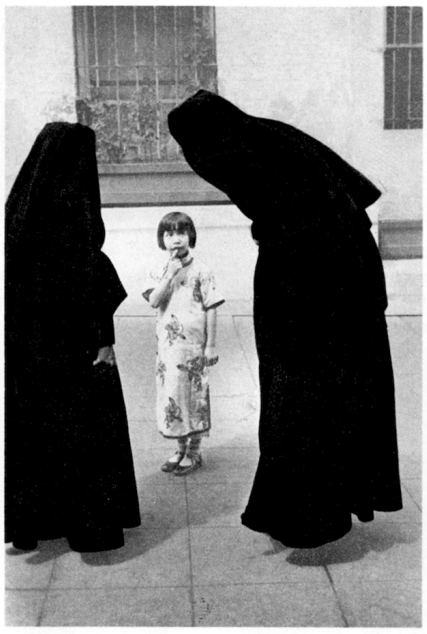
Lines of direction are the paths our eye naturally follows when we look at a photograph. In a well-composed picture the objects are arranged so that their shapes or main lines lead our eye unconsciously to the center of interest.

In this picture, the nuns' figures set up a circular motion. This keeps carrying our attention around and to the center of interest; our eye is not allowed to stray out of the picture area. The window bars, the lines in the pavement, and the shadow of the nun at left also point to the child.

There are psychological lines of direction here, too. The direction of the child's gaze–and the obvious direction of the nuns'–set up invisible lines which keep drawing our eye back and forth between the three figures.

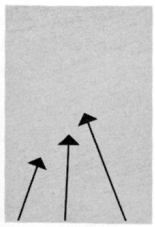


Value



Value is the lightness or darkness of a particular area or shape in your picture. One of photography's most striking characteristics is its ability to record a wide range of values or tones. There are three basic types of values–highlights [the bright whites and near-whites], shadows [the blacks and darker shades], and middle tones [the range of grays in between].

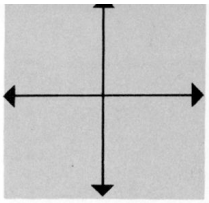
Value differences make clear where one object or area ends and another begins. The strong contrast between a dark tone and a light one immediately attracts the viewer's attention. Here, for example, the dark figures of the nuns framing the child stand out strongly against the light background, and so does the child's black hair. The viewer's eye is thus drawn forcefully to the center of interest.



Depth

Depth is the illusion of distance or of solid three-dimensional forms existing in space which we experience in looking at a photograph. This illusion can be very vivid, with objects in the foreground appearing to be physically closer to the viewer and those in the background farther away–although all exist only on the flat, two-dimensional surface of a photograph.

In this picture, the large figures of the nuns seem to be standing farther back than the front of the picture itself. The child is still farther back than the nuns. Farthest back of all is the building behind her. The shadows and the lines in the pavement lead back into space. The highlights and shadows on all three figures suggest the three-dimensional contours of solid forms existing in space.



Picture area

Your first consideration in composing a photograph is the picture area. This is simply the flat area within the borders of your viewfinder or picture. It is the space within which you compose the picture.

To use your picture area most effectively, you must weigh carefully *where* you place things and *what size* you make them. Your choice of size and placement should never be accidental or arbitrary. When you've arranged your objects in what appears to be a good composition, study their *size* and *location* in your viewfinder. Ask yourself: "Does this create the effect I had in mind?" If not, try moving closer or farther away or, if practical, move the subject. Explore the effect you get with different camera angles–keep trying all the possibilities of picture area which we demonstrate here, until you find the most interesting way to compose your picture.

Picture area and object size

The size of the objects in your picture has a great deal to do with the story it tells. Basically, large size gives emphasis. An object that fills the picture area seems large, close, and dominant to us. However, if an object takes up only a little of the picture area it generally seems small, distant, and isolated. This effect takes place no matter what the actual size of the object may be–its size in comparison with the picture area is what counts.

When we include two [or more] objects in a picture, their sizes can establish their relative importance for the viewer. We can place strong emphasis on a figure by letting it loom large in the picture area, while we keep the other figure smaller. Study the simple photographic demonstrations here to see how the relationships between picture area and object size work–and remember to choose sizes that are appropriate for the effect you want.

We'll try this figure in different sizes and positions in the picture area to see the effect it produces. Here the figure dominates the picture area because of its central position and size.

When the figure occupies much less space an entirely different effect is created. Now the man seems isolated and far away. Other picture elements could easily take attention from him.

The opposite effect occurs when the figure fills almost all the picture area. His size *overwhelms* the space. This is appropriate for a close-up, intimate view.

With more than one subject, use size differences to help tell your story. You can make one figure completely dominate another by a sharp contrast in size, as in this picture.

It's not necessary to have a great difference in size to direct attention to an object. Here the figure on the right seems nearer and more important although only slightly larger than the left one.

In this case, neither figure strongly dominates. Sometimes you may want to draw attention equally to two objects or figures–but usually the effect would be monotonous.

Picture area, camera distance—and purpose

The most direct control you have over picture area is the distance you choose to shoot from. As you move closer to the subject you include less of the scene, and the size of objects increases, so that they fill more of the picture area. How close you come depends on *why* you are taking the picture. You must be far enough away to include all the elements you need to tell your story and you must be close enough for the subject to be easily visible and dominate the picture area. [As you learned in the lesson on your camera and how it works, you may use lenses of different focal lengths to apparently change camera-to-subject distance without actually moving.]

Still photographers have adopted the language of motion-picture photographers to describe the kinds of pictures they take at various camera distances. We speak of *long shots*, *medium shots*, and *close-ups*. Although the terms are often used loosely, they do express important ideas.

A *long shot* is a picture taken from a relatively great camera distance. Long shots generally are used to show an entire scene or a large area—a big section of a stadium at a football game, for example, or all of a factory production line. Most scenic photographs are long shots, and so are those in which the center of interest is recorded small in a large expanse of space. [See the picture at upper right.] Long shots are frequently used at the beginning of photo stories to establish the location or setting; then medium shots and close-ups tell the story in specific detail.

A *medium shot* is a picture made from a distance about midway between that of a long shot and that of a close-up. Medium shots usually show all of the principal object or objects dominating the picture area, plus a portion of the surrounding environment. [See the picture at center right.] Medium shots often carry a picture story forward by identifying or focusing on a key subject of the total scene in the long shot. Then close-ups explore the subject in even more intimate detail.

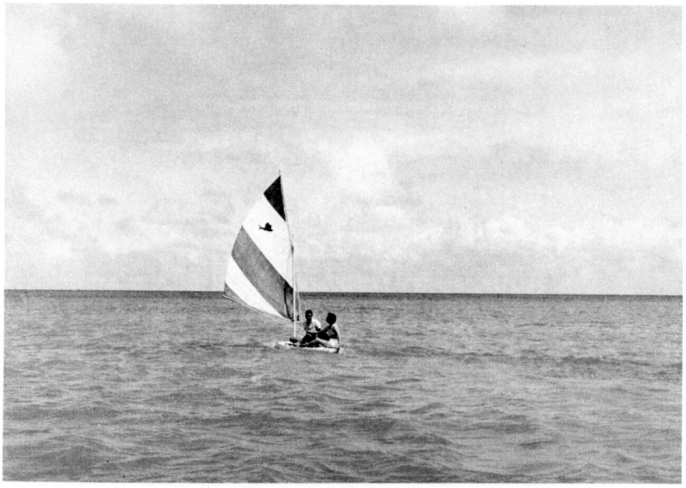
A *close-up* is a picture made from a close camera distance. It provides a detailed view of a small portion of the total scene. The subject almost completely fills the picture area. [See the picture at bottom right.]

The close-up is one of the most effective photographic shots because it concentrates attention forcefully on the center of interest. There are usually only a few elements in the picture area and the increased size of the center of interest lends it importance. Of course you, the photographer, must select *significant story-telling details* as the subjects of close-ups.

Choose the type of shot that best expresses your subject. In many cases, its size or its distance from the camera will dictate your choice, but don't decide until you've examined the subject thoughtfully in your viewfinder.

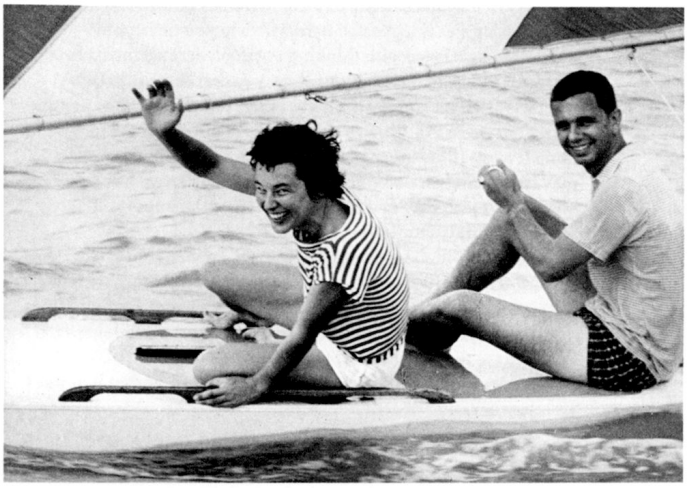
By intelligently mixing long shots, medium shots, and close-ups you can achieve greater variety in your pictures. In a picture story or a color-slide show you can use all three types of shots for better, more interesting pacing.

Close-ups, in particular, often are neglected by inexperienced photographers. When you want to show detail, don't be afraid to move close to your subject [up to the limits of your camera's focusing system, of course]. Come to grips with what you're showing. Become involved with it and make your viewer become involved, too.



By shooting from different distances the photographer can greatly vary the importance of different elements in his picture. This can change the meaning of the photograph quite a bit. In this long shot, for example, water and sky dominate the picture area. The boat is small and distant. The whole feeling is one of isolation, of being far out at sea.

In this medium shot we still see sky and water, but they now are secondary. The emphasis is on the sailors and the boat—on the act of sailing. We get a strong feeling of the boat in motion, heeled over by the wind.



The close-up says "sailors." The sky has been eliminated altogether and so has most of the water and boat. All of the emphasis is on the people and their evident enjoyment of boating.
[Photographs by Victor Keppler, courtesy Molson's Brewery Quebec Ltd.]

Picture area: arrangement and balance

Where you place objects within the picture area is equally as important as what size you make them. There are two basic considerations in placement: How you *arrange* your objects and how you *balance* the arrangement within the picture area. Good arrangement and balance help all the elements in a picture work together to express the point or story of the picture. Poor arrangement and balance, on the other hand, can produce a confused impression, so that the viewer won't be sure what the point of the picture is.

One of your basic purposes in arrangement is to get the meaning of your picture across to the viewer as directly as possible. Try to arrange your objects so that *all* important storytelling details can be seen clearly. Subdue all unimportant or distracting details or eliminate them entirely.

You can arrange the things in your picture to control the *order* in which the viewer sees them. Usually, first things come first–you should arrange your objects so that the most important one, the picture's center of interest, will attract the eye immediately. Sometimes, of course, you will prefer a more subtle approach. In any event, the arrangement should make clear the relationships between the various objects. We should be able to tell at a glance what is more important and what is less important.

When you're working in the studio or in a situation over which you have control, you can arrive at a good arrangement by moving the objects around and trying them out in different positions. In less controlled situations you may be able to move yourself and your camera, using the viewfinder to check the changes in the looks of things.

Applying common sense to arrangement

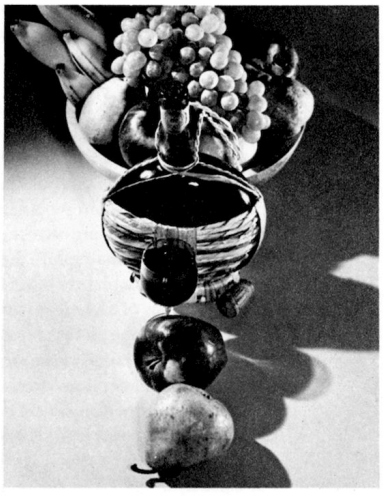
Arranging your objects within the picture area may seem to be a new subject to you, but actually you have a good deal of practical experience and judgment which you can apply to it. Basically the same rules of common sense hold true for pictures as for real life. For example, a picture, like a room, may be bare and empty, or crowded and cluttered, or have too much in one corner–and under normal circumstances none of these extremes is desirable.

The examples we give you here will help you tie in your everyday experience with thinking out good arrangements in pictures. These demonstrations show you that there is nothing mysterious about composing a picture. A poorly balanced picture doesn't make sense–objects seem about to fall out of the picture or to tip it over. If too much of the picture area is empty, the effect may be dull and monotonous; unless the blank space has a meaning or purpose, we are distracted from the important elements in the picture.

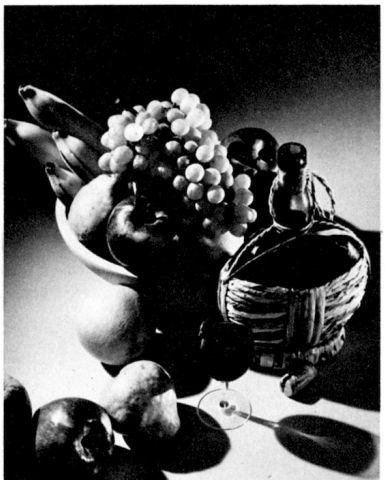
You can avoid these common errors by keeping *the whole picture area* in mind as you arrange things. Try to work with its full size and shape. Constantly check through your viewfinder to see whether you're making good use of all the area available. Check to see that you have a *picture*, not just haphazard placement–that it isn't overcrowded or lopsided, or that it doesn't violate other rules of common sense.

Don't line things up: This kind of arrangement usually doesn't work well because it is monotonous. The girl, the suitcase, and the hatbox are placed at equal intervals along a horizontal line.

Overlap your objects: Overlapping–placing an object so that it partly hides another–often can pull a composition together and make it more interesting. Better use is made of the overall picture area.

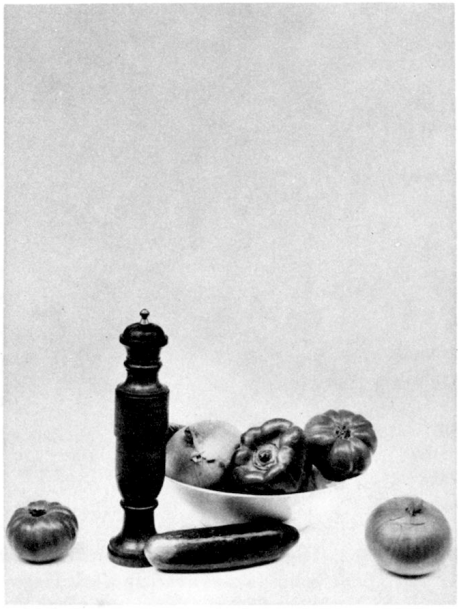


Don't center everything: These objects are overlapped, but not well. They're lined up vertically, cutting the picture area in half and creating a monotonous effect. Each object seems to rest on top of the one in front.

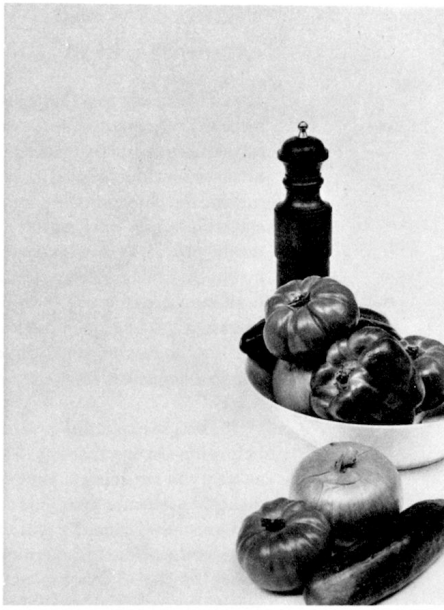


Vary the arrangement: This arrangement is more interesting because the objects have been moved to more varied positions. Also, fuller use is made of the entire picture area.

Topheavy: Topheaviness makes a picture look unbalanced. Here everything is needlessly crowded against the top border, wasting most of the picture area.



Bottom heavy: This reverses the fault of the previous arrangement; everything is jammed against the bottom. Again, most of the picture area is completely unused.



Lopsided: Crowding everything against one side leaves half of the picture area empty and makes the composition lopsided. It's like setting objects at the edge of a table—you get the uncomfortable feeling they're about to fall off.

Overcrowded: The objects in this photograph are too large for the picture area, and they're disorganized. They almost bump against each other; the picture is overcrowded and cluttered.

Good use of picture area: This arrangement is successful because it makes good use of the whole picture area. Space is not wasted, but neither do the objects appear crowded. Nothing seems to be falling out of the picture. The bowl and pepper mill are placed off center to avoid the monotonous bull's-eye effect that centering creates. Also notice that the onion and cucumber extend beyond the edge of the picture area. When *all* objects are fully included within the frame, the result can be uninteresting.

Picture area and camera position

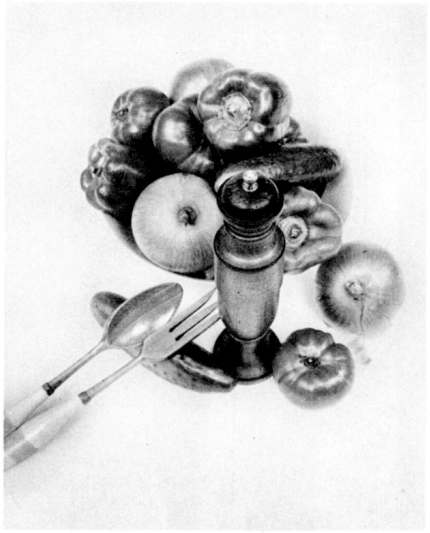
You have already seen that you can control size by changing *camera distance*—moving closer or farther away—and that you can control arrangement and balance in the picture area by moving the objects in the picture. Changing *camera position*—moving left or right, up or down—provides you with another control of arrangement and balance. Usually you will combine these controls, trying different combinations of camera distance, camera position, and arrangement of your objects until you find one that gives you the composition you want.

It's best to explore all possible positions before and during shooting. Move around the subject you are going to photograph. Try the right side, left side, even the back. Try eye-level and waist-level camera positions. What happens when you get close to the ground and aim from a very low angle? Or when you climb onto something for a high-angle shot? Your viewfinder will show you.

As you move you'll see arrangement and balance change. Objects will seem to block one another from one camera position and be clearly visible from another. Shoot from each position that gives you a picture that meets your purpose—but keep moving and shooting until you are sure you have gotten exactly the picture *you* want.

The examples on this page show how even simple changes of camera position can affect the arrangement and the meaning of a photograph.

Moving the camera up and down



High angle: This shot from above the subject shows a variety of salad ingredients, a pepper mill, a spoon, and a fork. Viewed from a high angle, all the objects seem approximately equal in importance.

Low angle: Here the camera position has been changed to a lower, head-on viewpoint. The ingredients of the still life are the same, but the meaning and effect of the picture have been altered by the change in shooting angle. The pepper mill dominates now; the surrounding objects are relatively less important.

Moving the camera to the side

Front view: Alfred Eisenstaedt photographed these four ballet dancers from the front, against a window, where they form a kind of frieze of figures. Although the composition is formally balanced in two halves, the differences in the poses of the figures and the dark letters on the window give the picture considerable variety.

Side view: Next Eisenstaedt changed his camera position and photographed the dancers in the same poses from a 45-degree angle. See how much more dynamic and informal the composition is now. The figures overlap and they and the windows become progressively smaller as they get farther from the camera. Although the two figures at right are larger, they don't make the composition lopsided. Because we see the *faces* of the smaller figures, they assume a psychological importance that compensates for their lesser size.

[Both photographs courtesy *Life* magazine, ©Time, Inc.]

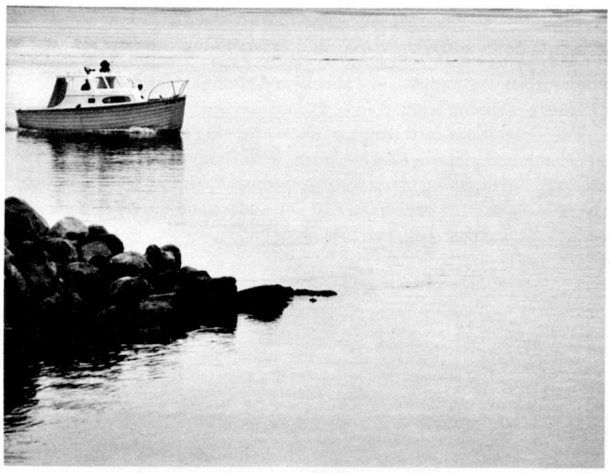
Timing and composition

You capture a photographic image almost instantaneously–in the fraction of a second it takes the shutter to open and close. Thus you record one moment in time, a moment that is different from all others. In every situation not completely under your control–every situation where objects move, where people gesture or change expression, where the light is shifting–you must be alert for the instant when all factors come together in the picture area to produce the composition that best serves your purpose.

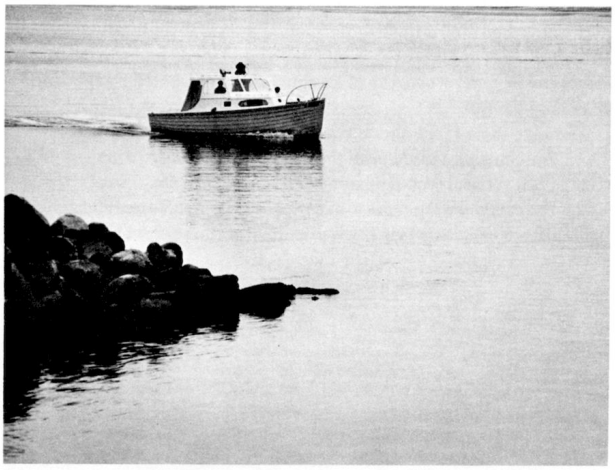
For the photographer, timing–choosing the right instant–has a direct, creative meaning because it is one of the basic ways you can control the arrangement and balance of objects in the picture area. You can *develop* your skill in timing, your ability to recognize and catch the fleeting moment when everything in the viewfinder looks right. Here are two things to help you achieve this skill:

First, learn to handle your camera quickly and automatically. If you have to stop to think about what camera controls to adjust, the moment may have fled by the time you're ready to shoot. The more you practice, the quicker you'll acquire this important skill.

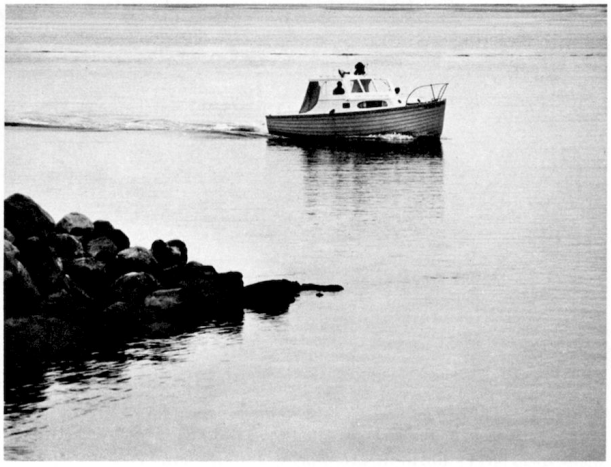
Second, sharpen your ability to recognize the arrangement and balance that are most effective for your picture idea. Carefully study the basic principles of composition demonstrated in the lesson till you're sure you know them. Then put them to work in deliberate, controlled situations so that their use becomes habitual. With practice, your ability to organize picture elements in clear, meaningful ways should grow until it becomes unconscious or almost unconscious. Then, when you work in changing situations, you'll be able to recognize and capture good compositions at the instant they form, before they come apart and the moment is lost.



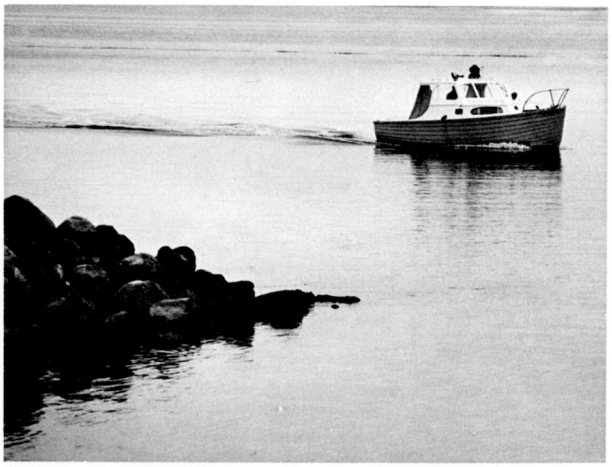
These four pictures were taken in less than three seconds; timing was the photographer's only control over composition. You'll see that only one moment was exactly right. Here the picture was taken too soon–the balance is lopsided, with most of the picture area left empty and wasted.



The timing is still too early. If you drew a line from the tip of the rocks to the bow of the boat, it would divide the picture area in half, with all meaningful elements at the left, and the entire right half of the composition vacant.



This is it–the instant when the best composition occurs. The boat, rocks, and areas of water balance one another and work together in a pleasing, well-organized composition. The picture area is fully used. Now, before it comes apart, shoot!



Here the moment is too late. The boat seems about to crash into the right edge of the picture area, and is leading our eye out of the composition. The long line of the wake emphasizes this movement. Boat and rocks seem to be pulling apart rather than working together. The composition is breaking up.

Picture area and cropping

It's to your advantage to plan your composition as carefully and as thoroughly as you can. As we've suggested, you should compose fully within the four borders of your viewfinder frame, considering the edges of the picture as well as the more central portions. However, even with the best planning in the world, you will occasionally have second thoughts about a picture. When you look at your prints you may discover details or areas of space that you think would be better left out. Or you may decide that a photo could be improved by changing the shape of the picture area. These and other problems can be handled by trimming off undesirable portions of the picture. This process is called *cropping*.

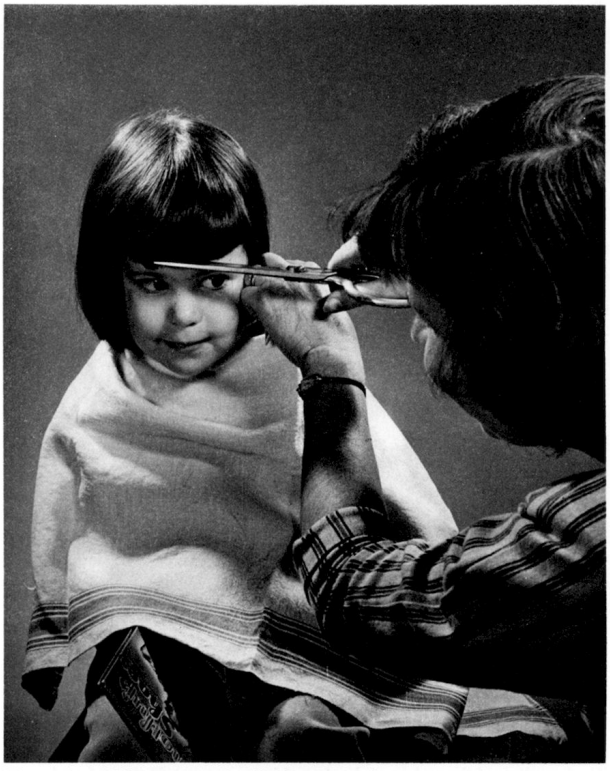
Cropping cannot save a bad picture–one that is weak and disorganized. But if the picture is well organized to begin with, cropping may strengthen it by adjusting the picture area to include only the strongest, most important elements. It's usually done in the printing stage, and in general consists of leaving out the unwanted elements and enlarging the rest.

Here are some of the effects you can achieve through cropping:

1. You can alter the *shape* of the area. A square may be made into a rectangle, a vertical rectangle into a horizontal one, etc.
2. You can make the *camera distance* seem to decrease. When you include fewer elements in the new picture area, these seem bigger and closer in the enlargement, as if the camera had been nearer the subject when you took the picture.
3. You can make the *camera position* seem to change slightly, moving up or down, right or left. This effect is purely an illusion and results from concentrating more closely on fewer things–as if we had moved over to emphasize these selected details.
4. You can change the picture's *horizon line*. Often you will get a slanted horizon line in a picture because the camera was tilted when you made the shot. It is possible to correct this by slight cropping, making the edges of the picture area parallel with the horizon and with vertical lines in the photograph.

Cropping is essentially a corrective technique which cuts off parts in order to improve the whole. It should be used sparingly. If you find that most of your photographs look noticeably better with cropping, the fault probably lies in your original seeing. Apply the cure at the proper point–when you compose and shoot–and eliminate the need for extensive cropping later.

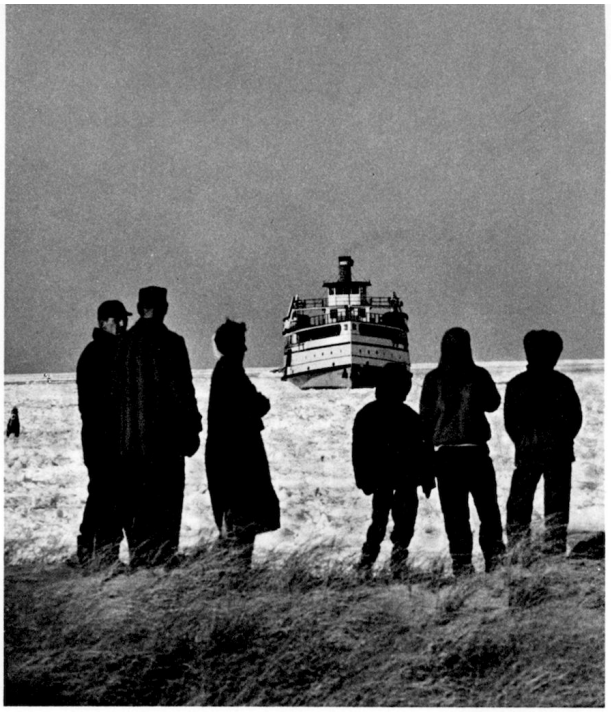
The illustrations on these pages show cropping used to make basically well-composed pictures even stronger. We'll demonstrate the actual procedure of cropping in our lesson on contact printing and enlarging. For now, we're more concerned that you understand the *whys* of cropping and the results it can help you to achieve.



Harry Garfield's picture of a child getting a haircut contains some unnecessary and distracting details at the bottom of the picture area–the curved edge of the towel, the woman's arm, and the picture book the child is holding between her knees. These compete with more important, story-telling details. There's also needless space over both heads.

Cropping considerably improves and strengthens the picture. The child's face and appealing expression are emphasized because Garfield made them larger and more prominent. The viewpoint is closer and more intimate. The distracting details at the bottom of the picture have been eliminated, and the woman with the scissors is given less importance. With this cropping Garfield made the picture horizontal–though, if necessary, he could have kept it vertical by retaining more of the arm and the space over the heads.

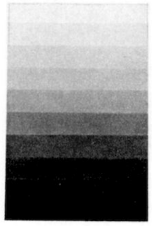
Here's an uncropped horizontal shot Alfred Eisenstaedt made for a picture story about Nantucket in the winter. The dark figures, outlined against the white ice as they watch the boat, make an interesting picture. However, the broad picture area tempts the viewer's eye to wander quite far from the center of interest, the boat itself. Also, the extreme right and left edges of the picture seem somewhat empty.



By cropping the photograph to this vertical format, Eisenstaedt creates a better composition which tells his story more directly. The wasted, empty areas are gone. Fewer figures are included, and they balance better with the boat and the picture area as a whole. We seem to have moved closer and to the left in comparison with the uncropped version. The ice-bound ferry now attracts our attention at once and holds it. [Courtesy *Life* magazine, ©Time, Inc.]

Here is a Philippe Halsman portrait of a beautiful girl—Marina Vlady. This is an effective portrait which expresses personality as well as sheer physical beauty. However, in looking at the full-frame print, Halsman decided that cropping could give the picture more impact.

Cropping has made the picture compelling, almost hypnotic in its effect. We are now as close as possible, our attention riveted by the face, and especially the eyes, the center of interest in most portraits. True, Halsman might have moved nearer to his subject when he took the picture, but too close a shooting distance may make the subject uncomfortable or cause unpleasant perspective distortion.



Value

Value is the second of the four basic elements of composition. Whenever you make a black-and-white photograph the colors and the lights and darks of the original scene are translated into various shades of gray. *Value means the lightness or darkness of these shades.* For example, a light gray is light in value; a dark gray is dark in value. Sometimes photographers also use the words *tone* or *tonal value* to describe the various shades of gray in a photograph.

On the facing page, at the left of the photograph, you see a photographic scale of values. It consists of ten squares or steps, ranging in value from white to black. Your photographic prints may contain many more subtle variations than we show here–but, in general, the value of any area of a print will correspond roughly to one of these squares. Whites and very light values generally are called *highlights* or *highlight areas.* Blacks and dark values are usually called *shadows* or *shadow areas.* The in-between values are called *middle tones.*

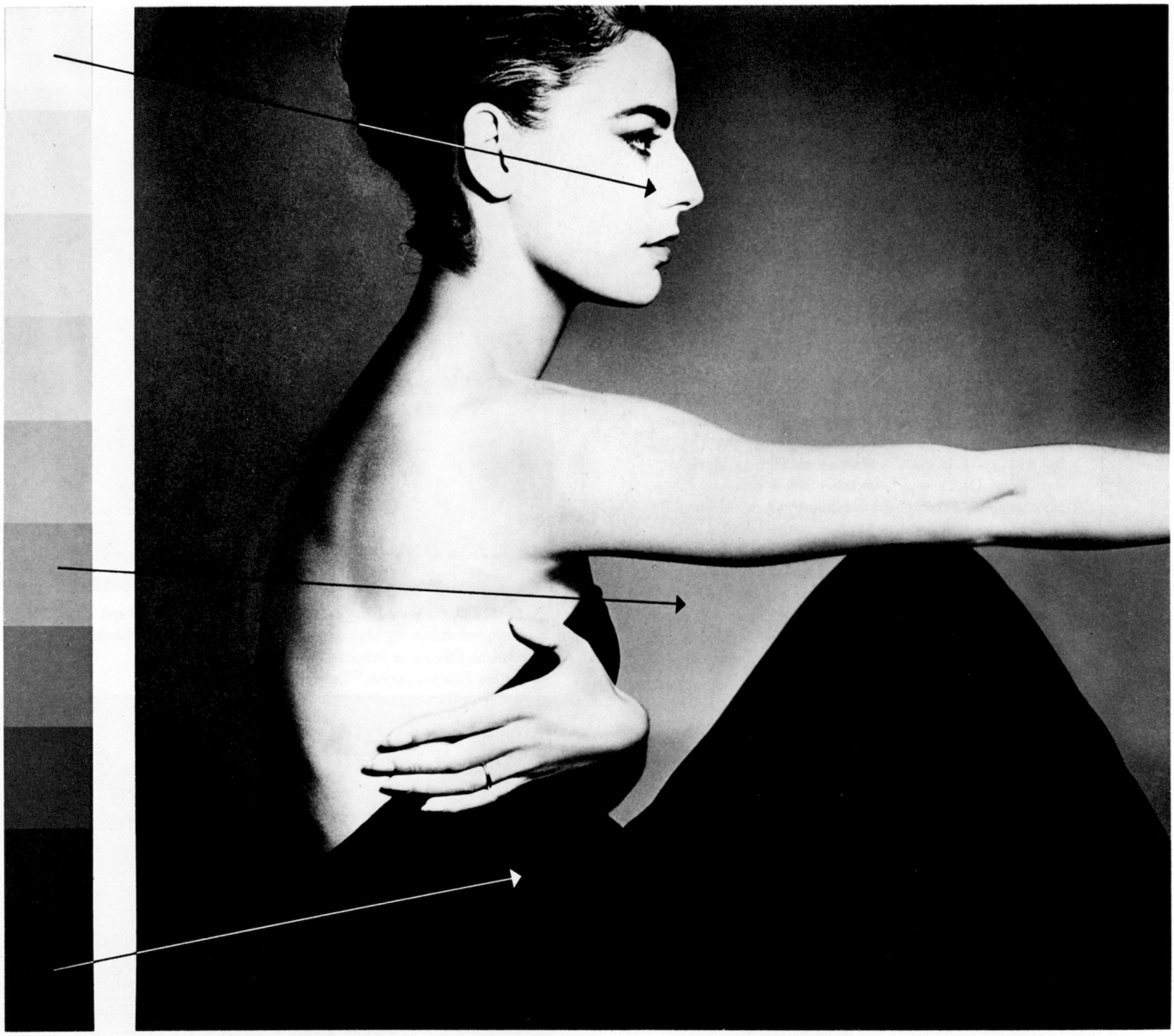
Two important uses of value

Value can make a number of important contributions to your photographs. You can use it, for example, to evoke a mood or feeling that is appropriate to your subject. The use of light values can intensify the light mood of a picture. If you want to suggest a darker mood, dark values may be in order. A picture intended to portray a mood of dark despair could be seriously weakened by predominantly light tones.

Value has another major job in photography–it makes things visible by contrast. If all the objects in a picture have much the same value, then nothing will stand out distinctly. You've probably seen photographs where the values of subject and background run together and are lost. A little more awareness of value contrast, plus a little more planning, could have avoided this.

Each time you prepare to take a picture, examine the image in your viewfinder. Visualize the values that the various colors will have when recorded in black and white. Ask yourself: Would my center of interest stand out more clearly with a darker background? Could I keep the background from interfering with the figure by reducing the contrast of light and dark in the background? Can I attract more attention to the interesting face of my model [for instance] by subduing the contrast between the background and the *rest* of the figure, which now competes with the face? By trying different camera positions or exposures, changing the lighting, or using a filter, you often can get the value you want. You also have an opportunity to modify your values in the darkroom.

A sensitivity to value is one of the marks of a good photographer. Thinking about value as we have suggested will help you develop this sensitivity, so that you won't settle for any middle gray, for example, but will be able to visualize what a somewhat lighter or darker gray will do to improve your picture.



Here Richard Avedon uses three basic values—highlight [skin], middle tone [background], and shadow [gown] in a simple but varied arrangement that is worth careful study. We have keyed each of these value areas to the corresponding step in the photographic value scale at the left, so you can see how they relate to each other.

In the picture, the light skin stands out more than the hair or dress because it contrasts more strongly than either of these with the gray background. The head, the center of interest, contains the extreme contrast of light skin against dark hair. The hand, set against the black gown, is also brought out very sharply. Sensitive consideration of values has helped to create a picture of outstanding dignity and beauty.

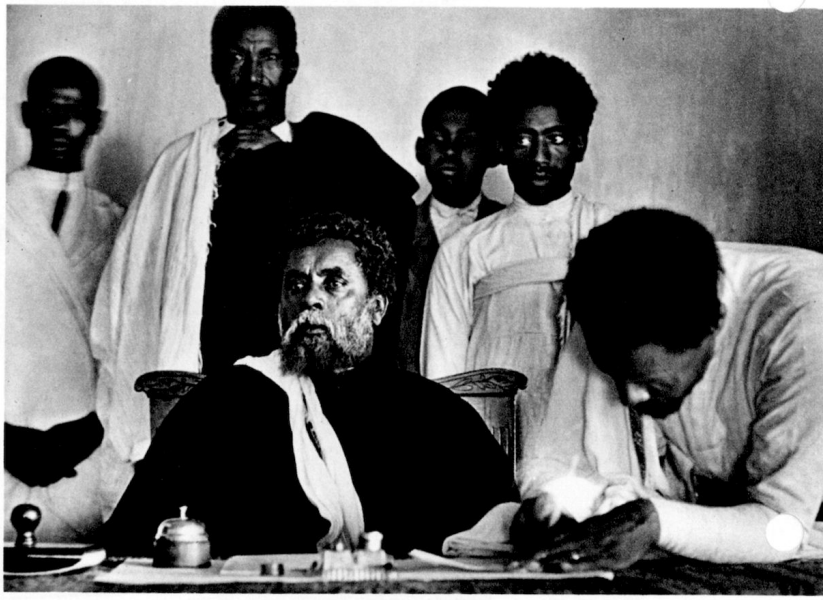
These two photographs show how much weaker Avedon's photograph would be without careful attention to values. In the photograph at the far left the background has the same value as the arm, so that the skin tones tend to blend into it, and the gown competes with the girl for our attention. In the second photograph the prominent highlights on the gown attract too much attention.

The emotional effect of value

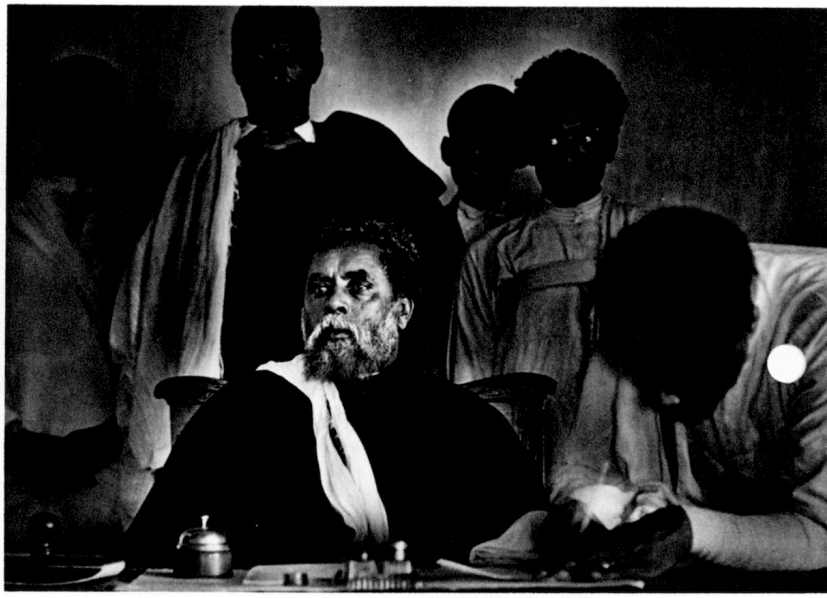
Values have deep-seated emotional associations for us. Light, bright things and places tend to make us feel happy, free, or unafraid. Dark, somber things suggest thoughts of sadness, menace, and fear. You can often evoke the same kinds of responses in the viewer by the *overall range of values* that you use in a photograph. This range of values is called the *key*. You can express brightness, airiness, or a light mood in a picture by photographing it in a *high key*, using highlights and lighter middle grays over most of the picture area. By working in a *low key*–emphasizing shadows and darker middle grays–you can suggest a feeling of drama, mystery, melancholy, dignity, or heaviness.

A pure high-key picture contains no dark values and a pure low-key picture no light values. However, such extremes are rare. Most of the high-key pictures you are likely to see or make will be predominantly light in value, but will probably contain a few accent areas of black or dark gray. The reverse holds true for low-key photographs–although predominantly dark, they usually will contain some small light areas or touches of highlight.

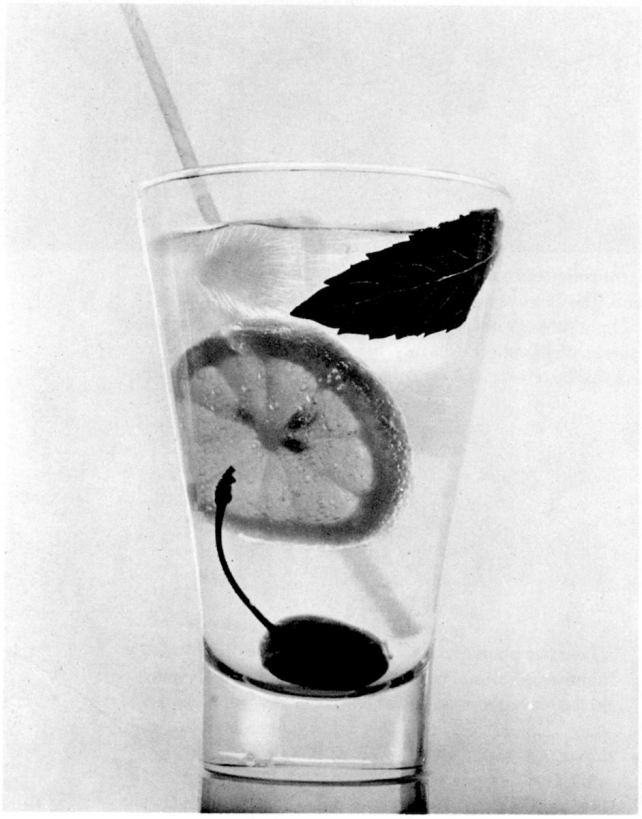
Of course, many photographs are neither high key nor low key. They contain both highlights and shadows, but are mostly composed of middle tones. However, when you want to emphasize mood in a picture, a high-key or low-key treatment can be a powerful aid, as the Faculty examples on these two pages demonstrate.



Normal: Reproduced here is a normal print of a photograph which is neither predominantly high nor low key. Taken by Alfred Eisenstaedt, it shows an Ethiopian judge in court.
[Courtesy *Life* magazine, ©Time, Inc.]

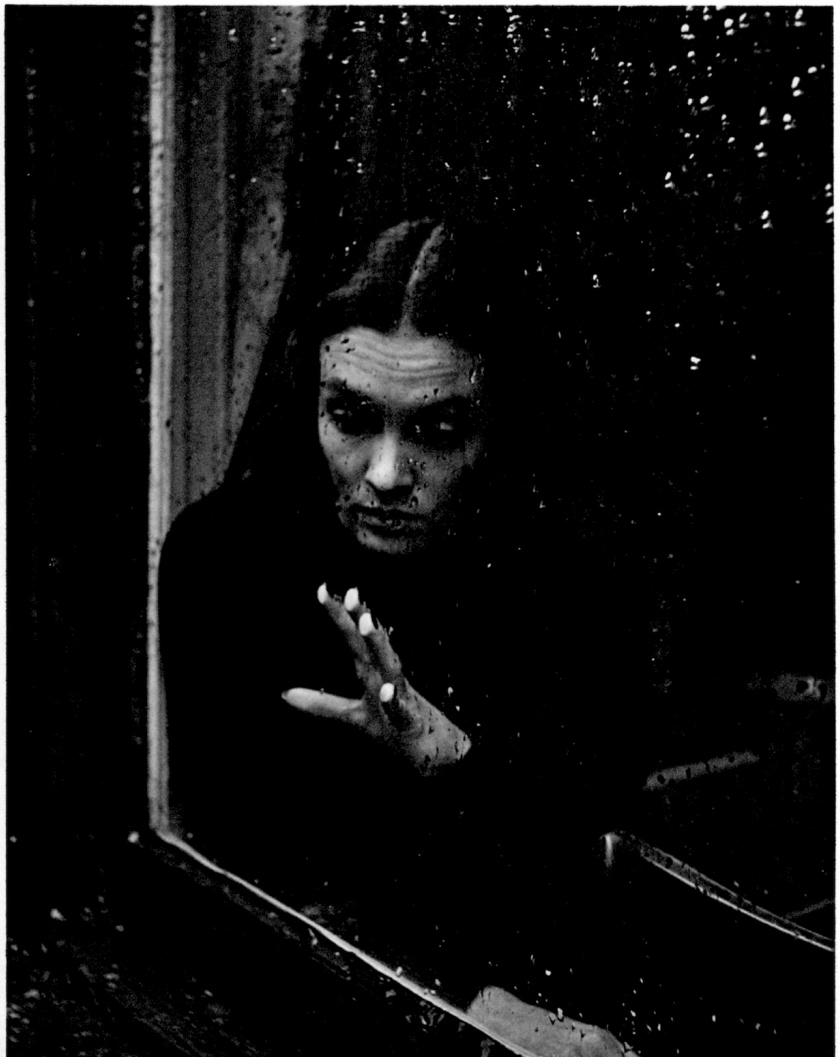


Low key: Here is the same picture with a low-key treatment. By lowering the value range so that dark tones predominate, Eisenstaedt has emphasized the stern dignity of the judge and the tension-filled mood of the courtroom. The low-key effect was achieved during printing–a procedure we'll discuss in detail in the lesson on contact printing and enlarging.



High key: The cool, refreshing quality of a summer drink was captured by Irving Penn through the use of high-key values. The leaf and cherry are dark accents, but everything else is very light.
[Courtesy *Vogue*, ©1951, Condé Nast Publications, Inc.]

High key: This fashion picture by Richard Avedon uses white and delicate light grays to create a light airy mood which is appropriate for the subject. The values bring out the soft, light qualities of the dresses. Notice that there are no strong blacks in the picture, except for the sash and hat streamers of one of the figures. [Courtesy *Harper's Bazaar*]



Low key: Philippe Halsman used predominantly dark values here to evoke a mood of rainy-day melancholy. The low-key range of values reinforces the forlorn pose and expression of the woman. The only whites are the highlights on scattered raindrops, and the tips of the woman's fingers against the pane. [Courtesy *This Week Magazine*]

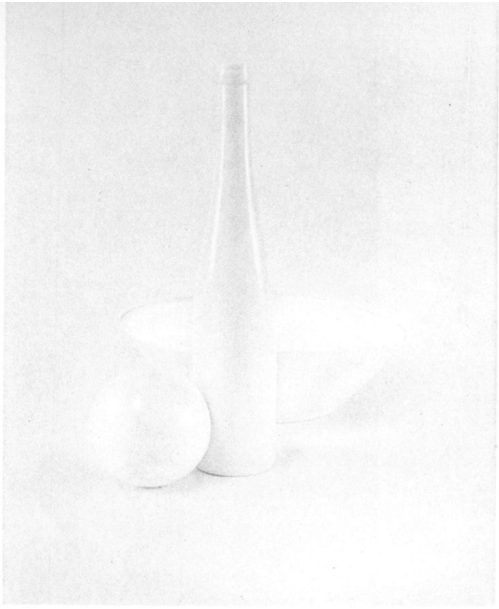
Using values to center attention

We have just seen how value can be used to heighten the emotional effect or mood of your photographs. Now let's look into some other significant ways that value can serve you in making better pictures.

You can use differences between values—*value contrast*—to direct attention. An object attracts the eye instantly when it is next to a value very different from its own. For example, a black cat seen against a snowy background will stand out clearly and sharply. Use this principle of playing dark against light [or vice versa] to focus the attention of the viewer where you want it—on the center of interest.

On the other hand, when an object is surrounded with values very like its own, it is less likely to attract attention, because there is *little value contrast.* You can apply this principle to subordinate the less important parts of a picture and keep them from competing with the center of interest. For instance, suppose you're photographing the black cat we mentioned, as it passes across a patch of snow in front of some dark shrubbery. Suppose, too, that there is a large dark rock nearby, and you don't want to photograph this against the snow or it might detract from the cat. A good solution might be to choose a camera angle which places the rock against the shrubbery. They would merge because they have similar values, and the rock would not compete with the cat.

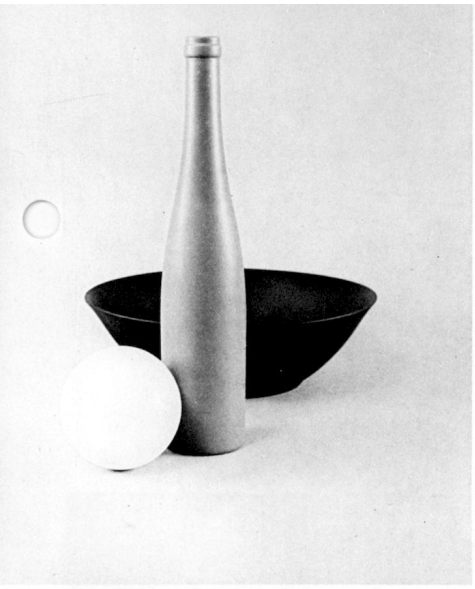
When you plan a composition, keep the values of the objects in mind. Remember that by contrasting the value of one thing with another, you can create a center of interest. Obviously you achieve the strongest and most attention-getting contrast by placing the lightest object or detail against the darkest one, or the other way around. You can make other objects less important by grouping them with things that have approximately the same value. The four still-life photographs demonstrate these points, and the Faculty pictures show how they are applied in professional assignments to achieve strong, clear compositions.



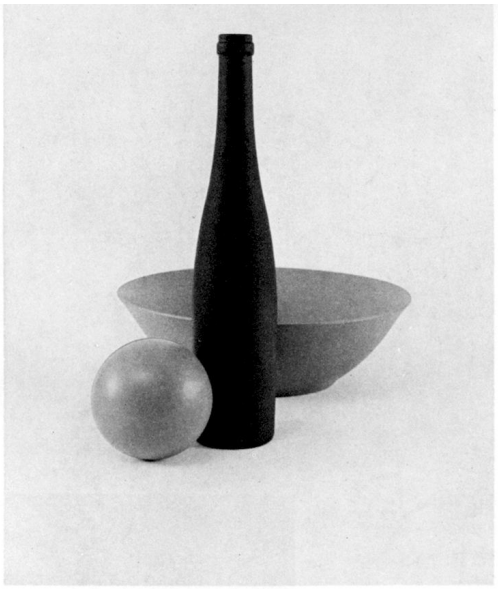
1 In this pure high-key picture the bowl, ball, bottle, and background all are approximately equal in value. No one object stands out more than any other. They blend into each other and the background.

Light against dark

The use of a simple light-against-dark value scheme adds great impact to this portrait of Sophia Loren by Irving Penn. Contrasting values already existed in the subject—light skin tones against the dark hat. Penn powerfully accentuated this natural contrast by his unusual choice of lighting. He used an electronic-flash unit fitted with a "snoot" [a funnel-shaped device which directs the light into a narrow beam] to illuminate only the face and a portion of the background. Thus we see the face in clear, fully exposed detail, with the hat recorded as a black shape. The strong value contrast between the oval face and the larger shape of the hat instantly compels our attention.
[Courtesy *Vogue*, ©1959, Condé Nast Publications, Inc.]

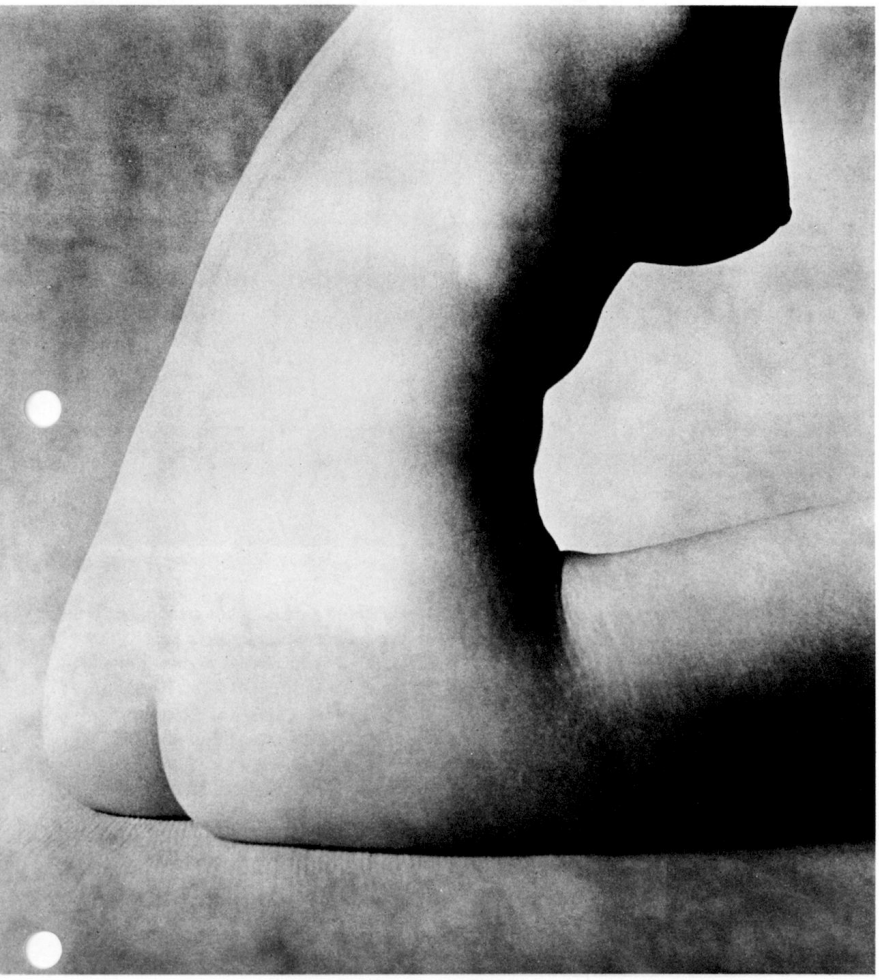


2 Here we have varied the values of the objects to separate them and create a center of interest. The three objects stand out distinctly from each other and the background. Our attention is attracted by the area of greatest contrast—where the dark bowl meets the light background. The bowl is the center of interest.



3 Here the bottle becomes the most important of the three objects. It has the darkest value and therefore contrasts more strongly with the light background than the bowl or ball does. Notice that where the ball overlaps the bowl the two shapes tend to blend; the tones almost merge.

4 In still another variation, the ball stands out immediately as the most important object. This time the greatest contrast in the picture is between the white ball and the dark bowl and bottle. Remember, contrast creates emphasis. Use it to attract the viewer's eye to important parts of your picture.



Dark against light

Value differences may exist in the subject itself, but often you can achieve strong value contrast by the effect of light and shadow, too. In this figure study Irving Penn reduced his picture to very simple elements—a portion of a nude torso and a plain background. By the way he arranged the lighting to create value differences he produced a composition of great strength. The light from the side throws the portion of the body on the right into dark shadow. The greatest value contrast in the picture occurs here, where the black contour of breast and stomach is outlined against the medium gray of the background. This becomes, as the photographer wished, the single most important line in the picture.
[Courtesy *Vogue*, ©1960, Irving Penn]

Light, shadow, and value

Two factors play an important role in establishing value and value contrasts. One is the natural lightness or darkness of your subject: Snow is white, concrete is gray, and coal is black. The other is the quality and direction of the lighting. When a scene is brightly and uniformly lighted, the natural values of the objects and surfaces show up clearly. But when most of the light comes from one direction and is strongly concentrated, we see new areas of value–the shadows and highlights of objects.

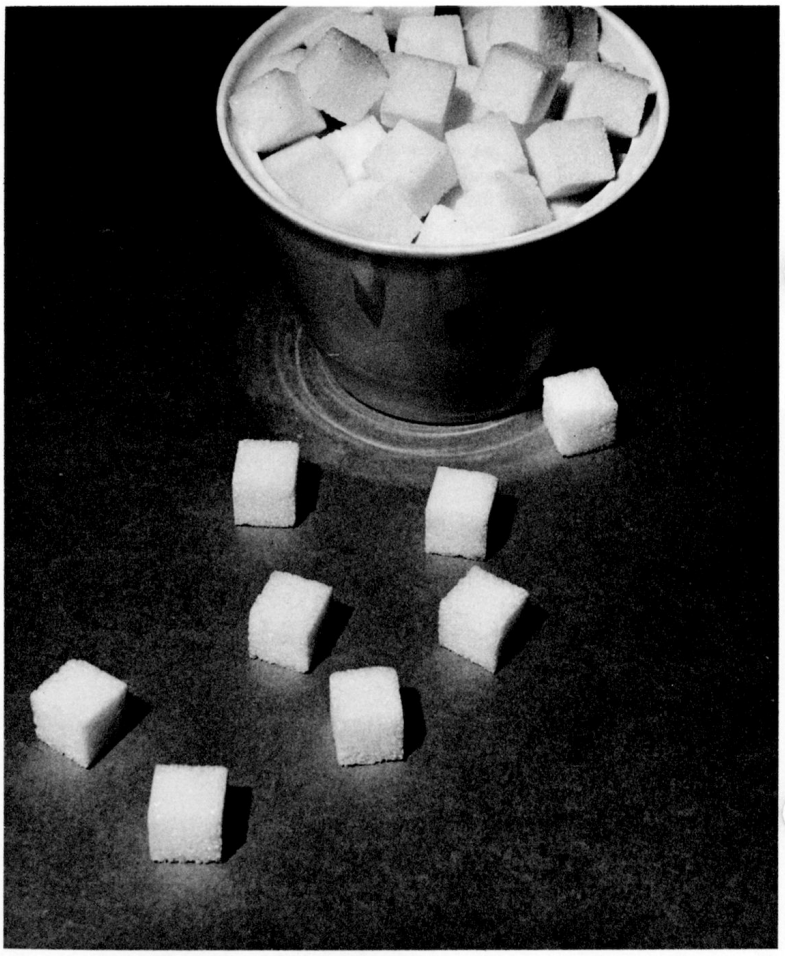
To understand more clearly what this means, let's consider three basic types of lighting–frontlighting, sidelighting, and backlighting–and the effect they have on values.

Frontlighting is light that comes from behind the camera [as, for example, when the sun is over your shoulder] or from close to the camera position [as when you have a flash unit attached to your camera]. This gives the fullest, most even illumination to the part of the subject facing your camera and shows up the natural values. If you move the light more and more to one side, more and more shadow area will become visible to the camera. With the light coming from directly behind the subject, backlighting it, the subject itself will be entirely, or almost entirely, in shadow. A different effect occurs with the surfaces on which objects rest, such as a pavement or a tabletop. Horizontal surface values grow lighter when illumination comes from behind the subject because more light is reflected off the surface and into the lens. The demonstrations on these pages illustrate these effects.

The dark shapes created by shadows can be just as important in arranging and balancing your composition as can the shapes of actual objects. Obviously, the lighter the surface on which the shadows fall, the more important they become because of the greater value contrast created.

You must be particularly careful in judging shadow areas. They often will register darker in your photograph than they appear to your eye when you look at the scene–which means they will be stronger and attract more attention in your picture. In fact, when they fall on a light-valued surface, they may create the greatest contrast in the picture–a sure way of attracting attention, as you have learned.

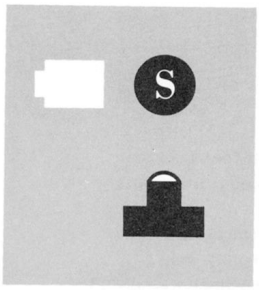
When shooting, you have various controls over these effects of light and shadow on value. You can change camera position so that you are looking at the subject from the angle at which it receives the best light. Or you can move the subject to take advantage of the light. When you set up the lights or use flash you can often control the direction from which the illumination comes. You can also add more light on the dark side of objects to lighten the shadows. We'll explain all these controls in detail in our lessons on lighting.

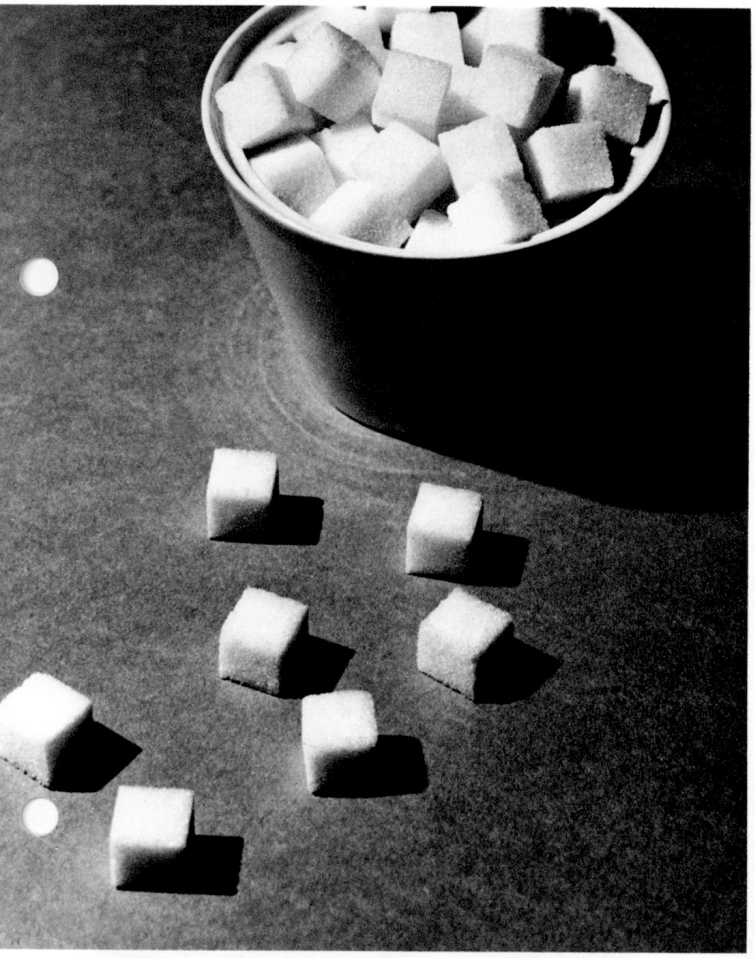


Frontlighting

Frontlighting comes from a light source behind or close to the camera position. It falls on the surfaces of objects facing the camera and is reflected back into the lens. The natural values of the objects register on the film. Shadows are cast *behind* the objects, mostly out of sight. Notice how little contrast there is between the top and front planes of the sugar cubes on the table. If it weren't for the small shadow areas these cubes would look almost as flat as cut-out bits of paper.

This kind of lighting is referred to as flat lighting because it tends to make objects appear somewhat flatter [less solid or three-dimensional] than sidelighting, which accentuates the form by bringing out the different planes of tone more clearly.

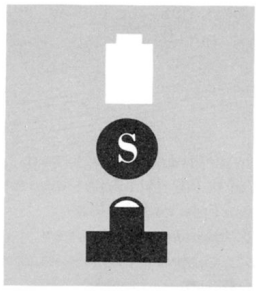


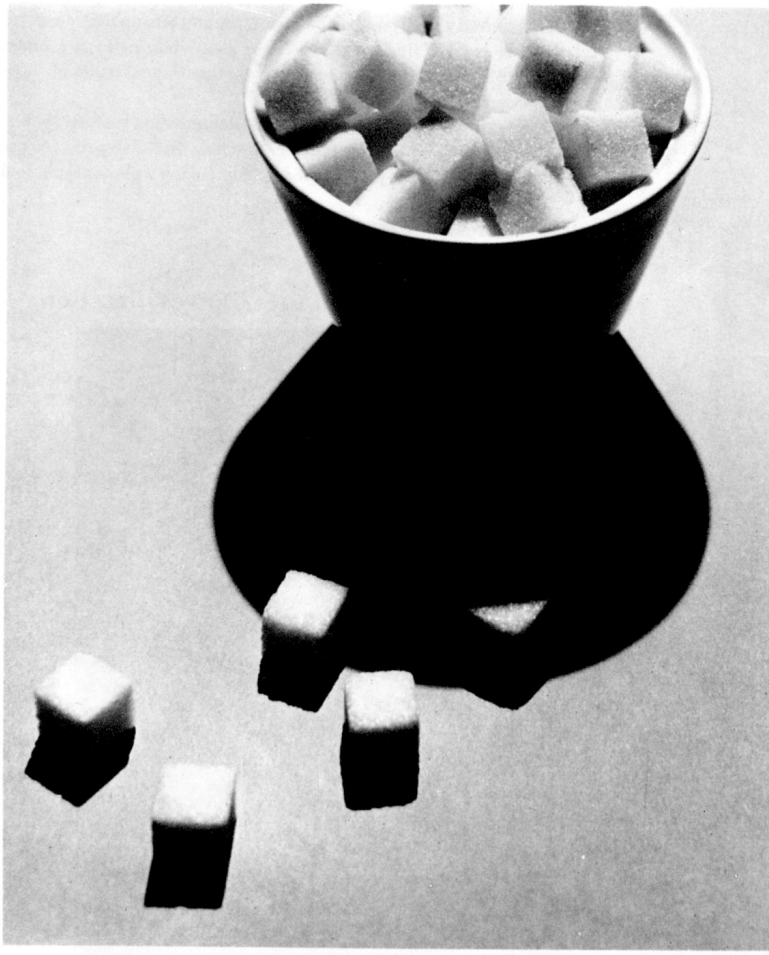


Sidelighting

When the light falls from one side, see how the values change. Only the tops of the cubes are white now. The sides toward the camera are much darker. The value of the bowl has also darkened.

The change in light direction has made the cast shadows larger. These shadows and the marked contrast between front and top planes make the cubes on the table appear much more solid. The cubic form of the sugar in the bowl is also more pronounced.



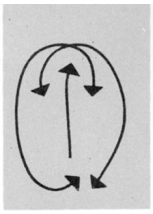


Backlighting

The picture has a completely different appearance when the light comes from the back. Front surfaces now all have the same value–black. And see how the value of the table surface has lightened. This is because the light falling on it is reflected directly into the camera.

Values have shifted so much that this picture has a very different compositional effect than the other two. The contrast between the cast shadow of the sugar bowl and the light tabletop is very strong. The bowl and cast shadow form an hourglass shape, which dominates the composition. Some of the cubes are completely lost in this shadow.

Although our subject is as simple and commonplace as a sugar bowl and cubes, the backlighting gives it a dramatic quality. This effect can be much stronger–it can suggest a powerful mood or a feeling of mystery or excitement–with a more dramatic subject.



Lines of direction

There are three kinds of lines of direction in pictures. *Actual lines* are lines you can really see; they are the edges of buildings, telephone wires, stair railings, the sharp demarcation between light and shadow–anything that forms a line in the real world. *Implied lines* are those suggested by the motion, thrust, or shape of an object–for example, the direction of movement of a speeding car, or the spire of a great cathedral pointing heavenward. *Psychological lines* also are implied, but in a different way. They are the lines our mind sets up to connect related objects. The "line" of gaze between people talking to each other, or of people all looking at the same thing are familiar examples of psychological lines.

All three kinds of lines are important in composition because they can serve as lines of direction–the lines that help establish paths for our eye to follow through the picture area. In composing a photograph, look for the main lines in the scene and see that they lead to the center of interest. Wherever possible, avoid strong lines that lead to unimportant parts of the picture or out of it altogether.

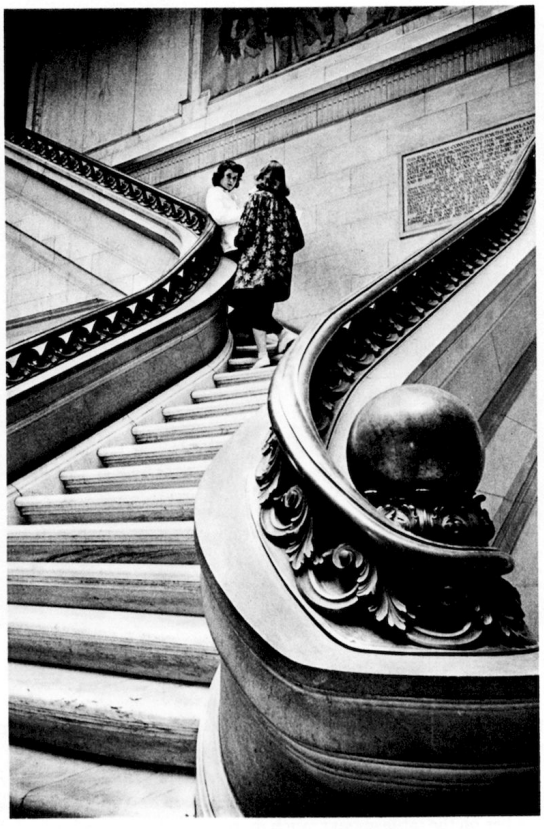
It's also important to be aware of the kind of movement lines of direction create. They can guide the viewer's eye smoothly and rhythmically from one thing to another, or the movement may be abrupt or staccato. Your subject and the mood you want to communicate should determine your choice. However, guard against too much abruptness; it can make your composition jumpy and disjointed.

Study the photographs on these pages. They show you how Alfred Eisenstaedt uses lines of direction to help create forceful, excellently composed pictures. The accompanying diagrams show the principal lines of direction in each photograph.

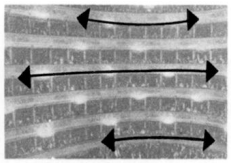
[All photographs on these two pages courtesy *Life* magazine, ©Time, Inc.]

How Alfred Eisenstaedt uses lines of direction

This photograph shows two students on a stairway. There are strong lines of direction here–the border below the mural, the stair railings, and the stairsteps themselves–but they lead us all over the picture, not just to the center of interest, the two girls. Following the thrust of the mural lines we encounter the left railing at the top and follow it down, past the girls, almost out of the picture. The line of the lower step carries us across, right, to the other railing, which leads up and out the right edge. The staircase creates a movement upward leading to the inscription below the mural. The mural itself, the staircase, and the statues compete with the two figures, and the foreground area is barren and uninteresting. Eisenstaedt was not satisfied with the composition of this picture.



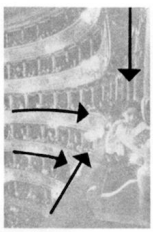
Eisenstaedt's solution was to move closer and a bit to the right. This not only eliminated the statues and foreground and much of the staircase and mural; it also made the lines of direction focus attention on the students. Now everything leads to them. The railing on the left points to them from above and below. The thrust of the lower part of the right railing is so strong it creates an implied line leading right to them. The steps help, too–they form a very direct path, leading into the composition at the bottom, and narrowing until they bring our eye to the figures. Moreover, the two railings and bottom of the mural form a kind of inverted triangle, which frames the girls much more tightly than in the other shot. Using important actual or implied lines of direction, as Eisenstaedt does here, can greatly help you knit your composition together into a unified whole, and make viewers see the things you want them to see.



Here are two shots Eisenstaedt made while doing a picture story on the elegant and famous La Scala opera house in Milan, Italy. In this view, from one of the balcony tiers, he shot straight ahead with his camera held in a horizontal position.

Notice that the balcony tiers form alternating dark and light bands which act as strong horizontal lines of direction that lead our eye back and forth across the picture. The upper and lower lines curve inward toward the center of the picture and tend to concentrate attention in this area. The columns separating the boxes on each tier form weaker vertical lines of direction that interrupt, without destroying, the forceful horizontal movement in the composition.

The result is a pattern created by the rhythmic spacing of the lines, the alternating bands of light and dark, and the regular accents of the bright lights. The photograph has no distinct center of interest. It is a pleasing design, but does not strongly focus our attention on any particular detail.



Next, Eisenstaedt saw a girl sitting on the balcony to his right. He turned, changed his camera to a vertical position, and shot from this new viewpoint. Lines of direction now play a much more direct, purposeful role in the composition, making it much stronger than the previous one.

The girl, with her lovely, pensive face, is the center of interest, and all important lines of direction lead forcefully to her. The railing of the center balcony pulls our eye toward her figure whether we start at the bottom of the picture or on the left edge. The upper balcony tiers curve toward the top of the picture, but the vertical pillars catch our eye and lead it down to the girl. The lower tiers curve into the railing, which again leads our attention to her. Wherever our eye begins in this precisely composed picture it comes to rest exactly where the photographer wants it—on the girl.

The emotional effect of lines

The lines in your compositions not only lead the viewer's eye, they also can affect his emotional response to your picture. This is because horizontal, vertical, diagonal, and curved lines suggest various feelings or moods. As with so many aspects of composition, this effect is based on our everyday associations and observations. An understanding of the emotional qualities of lines can help you compose your pictures more effectively, as we will demonstrate.

Here are the basic kinds of lines and some typical qualities we associate with them:

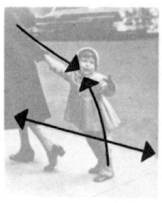
Horizontal lines suggest rest or serenity. We associate them with the human figure in repose, the long, calm horizon of a peaceful ocean, and other images of silence and peace.

Vertical lines suggest height or dignity. They soar upward. Our common associations with them are based on the vertical lines we find in the lofty columns of public buildings or the tall spires of churches. Imposing objects such as the Washington Monument or the Statue of Liberty tower over us vertically.

Diagonal or slanting lines can create a feeling of movement or

Vertical lines

To take this picture Ezra Stoller chose an angle which emphasizes the soaring vertical lines and form of this tremendous New York skyscraper, the Seagram Building, giving it a sense of great height and majesty. The verticals take us up and up, as indicated by the arrows in the diagram. By not showing the top of the building, Stoller allows us to continue further upward in our imagination, making the building seem even taller. Note that Stoller was careful to select a view which shows the flat openness of the plaza, creating a firm foundation for the upward-reaching verticals. [Courtesy The House of Seagram, Inc.]



Diagonal lines

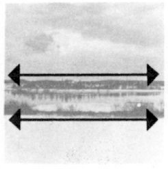
The strong lines in this dynamic picture by Philippe Halsman are all diagonal and all lead directly or indirectly to the child's face—the line along the two tugging arms, the line up the child's leaning body, the line between the child's black glove and head, and the line of the curb. These lines not only control attention, they suggest movement, tension, resistance. The diagonals of the woman's leg and coat and the line in the pavement reinforce this feeling. This is a posed photograph, taken to illustrate the idea, "Would your child have to be brought up by strangers?" for a life insurance advertisement, and Halsman planned all of these elements to create strong emotional impact. [Courtesy John Hancock Mutual Life Insurance Co.]

tension. Compared to the repose of horizontals or verticals, diagonals seem active or excited; we associate them with conflict or the action of falling or hurrying.

Curving lines suggest softness, gentleness, or a rhythmic feeling. They convey a sense of movement, but in a less abrupt and violent way than diagonals. We associate curves with beauty, with the female figure, and with most forms in nature.

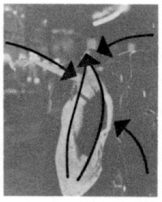
Of course, you will use more than one kind of line in most pictures. In fact, strong, interesting effects are created by contrasting various lines—the curves of a human figure against the horizontals or verticals of buildings or machines, for example, or the vertical lines of tall trees against the sweep of a horizon line.

The dominant lines in your subject will often suggest whether it should have a horizontal or a vertical format. Landscapes and seascapes, low buildings, the human body at rest—these are subjects that naturally fit a horizontal frame. On the other hand, a tall person, a skyscraper, a high tree, or a mountain peak can be made to seem even higher by emphasizing the vertical lines in the subject with a vertical format.



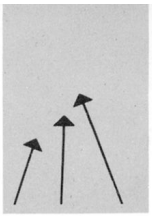
Horizontal lines

The dominant lines in this picture are horizontal. Victor Keppler used them to suggest a sense of repose, tranquillity, and silence in this Canadian winter scene. The short verticals of the pine trees, with their reflections, and the upthrust branches of the foreground bushes provide important little contrasts which interest the eye along each horizontal line and add a note of variety. The horizontal format was a logical choice to support the mood, just as the vertical one was for the tall building in the first illustration. [Courtesy Calvert Distillers Co.]



Curving lines

Elegance, softness, femininity, beauty, and flowing movement—Richard Avedon has used curving lines to convey these qualities as he leads us to the center of interest in this striking fashion photograph. Almost every line is a curve—the arms, the body, the folds in the material, the contours of the car, the lights and their reflections, even the shadow on the driveway. The circles and curves guide our eyes pleasantly around the picture and emphasize the sinuous beauty of the model and her gown.
[Courtesy *Harper's Bazaar*]



Depth

Depth, in a picture, is the illusion that things exist in three-dimensional space—that they have height, width, and depth, just as they do in the real world. Almost any photograph you take will have a sense of depth and distance since it is a record of things as they actually exist. Often, however, you can really capitalize on this element of composition and use it in a creative way to strengthen the interest and meaning of your pictures.

Before you can make effective use of depth in pictures you must be aware of a number of basic principles or "visual clues" that help you to see it in real life. Here are the most important of them:

1 Parallel lines seem to converge or come together in the distance. The familiar example is the railroad track whose two sides appear to come to a point on the horizon.

2 Near objects appear larger than distant ones.

3 When you are right up against an object—say a desk at which you are writing—you see only a part of it. The rest of it is outside your field of vision.

4 Near objects often overlap more distant ones.

5 The farther you are from an object or a background, the lighter it appears.

6 When something is close to you, you can see its texture and details clearly—but not so clearly when it is farther back. For example, you can see every marking and detail in a cat's fur if you are near the animal, but only the overall pattern or coloration of the fur if the animal is some distance away.

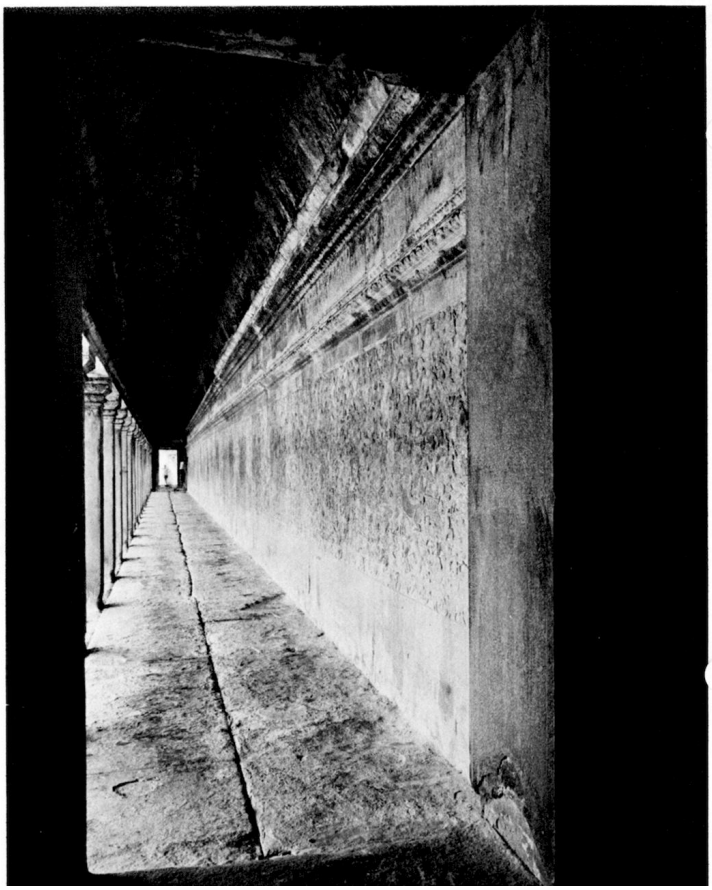
7 Shadows emphasize the feeling of depth in a picture.

The illustrations show you examples of how you can apply these principles in your pictures. Naturally there are many other possibilities. The important thing, however, is to arrange or photograph your objects in depth so that they express the picture idea accurately. *Purpose and the effect you are working for* must be the guiding considerations here, just as when you arrange your objects within the borders of the picture or picture area.

Making interesting compositions in depth

As you study your objects in the viewfinder, visualize how they will look on the final print. Check to see that they make a varied, informal, and interesting pattern in depth. Unless there is some special reason for it, it's undesirable to show objects lined up in a row, crowded into a half or quarter of the picture depth, or forming an obvious design such as a triangle or a cross.

You can often solve these problems—and increase the interest in a picture—by *moving around in depth* and selecting a different view from the one you start with. By choosing another view it may be possible to stagger the objects at different intervals, or to make some large and some small for the sake of variety. You might also try a view from the side in place of one from the front, or change the angle of vision in some other way. Think—experiment—move your objects or your camera around in depth until you arrive at arrangements that are fresh and expressive. That is what the best photographers do.



Converging lines

One of the most impressive features of this colonnade is its length or depth—so it was logical for Ezra Stoller to dramatize it in this photograph. Notice the visual clues he uses to produce the strong sense of depth. He shows the sharply receding parallel lines of ceiling, floor, wall, and colonnade that converge toward the doorway at the far end of the colonnade. The columns grow smaller with distance, and there is an emphatic contrast between the large doorway in the foreground and the greatly reduced one in the background, with the tiny figure standing in it. Up front we can see textural detail in the floor and wall, but this disappears farther back.

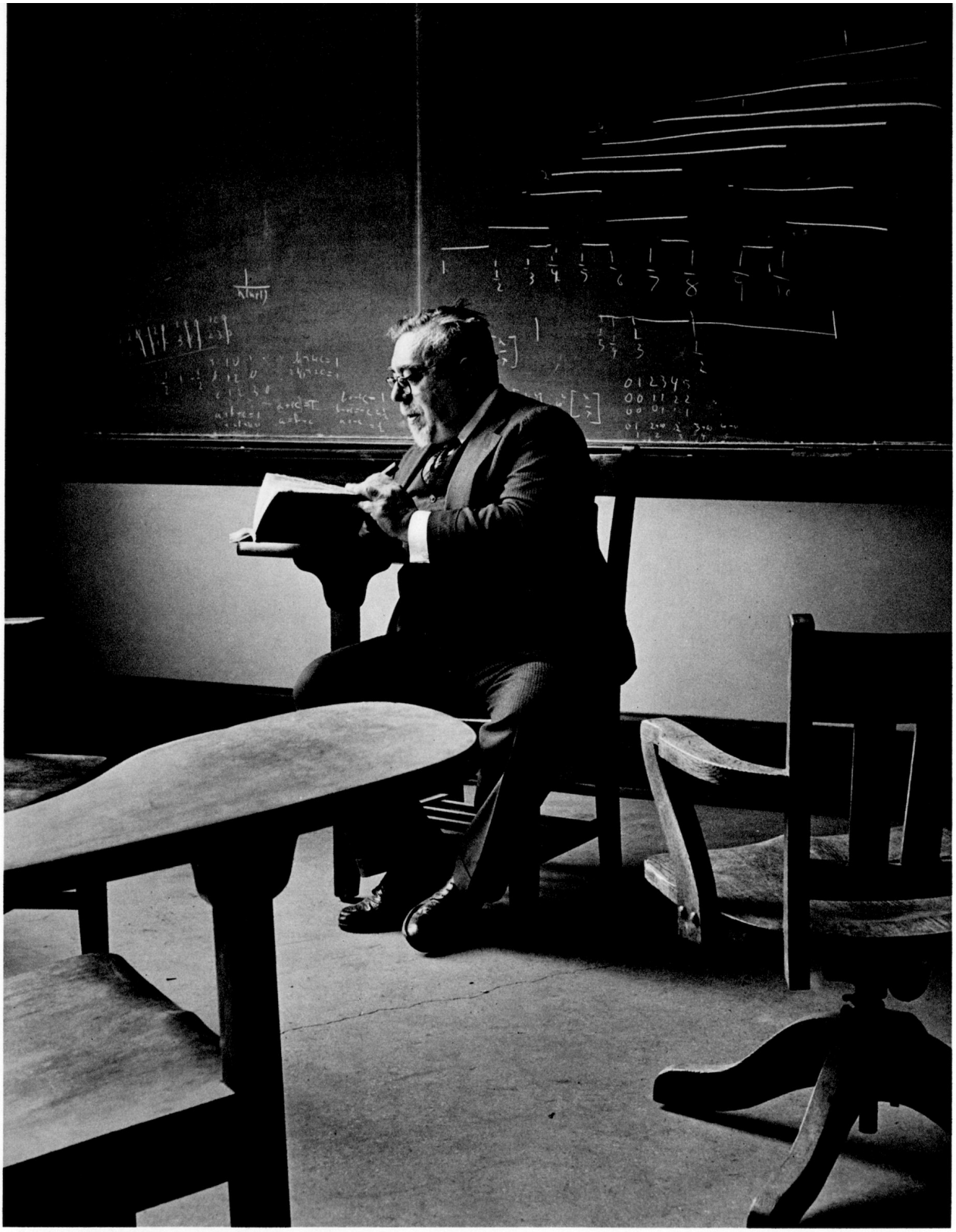
The visual clues are so strong here that it is difficult not to feel the depth. Try to look at the picture simply as gray areas on flat paper; the elements of depth or perspective keep drawing you into a "real" space instead.

Overlapping

In this photograph by Irving Penn showing a group of artists and writers in Rome's Café Greco, the room has much the same structure as the colonnade photograph on the facing page. The view chosen by Penn emphasizes the converging parallel lines of the walls, ceiling, benches, and floor, which carry our eye back in depth.

The overlapping, irregular arrangement of the figures and their gradual decrease in size as they go farther back in the picture also strengthens the feeling of depth and interest here. Just imagine how monotonous this photograph might appear if the people were lined up in two even rows, facing the camera.

It is not always necessary, or even desirable, to stress depth in your pictures. However, you should keep in mind that it can often add an element of freshness and interest if you use it appropriately.
[Courtesy *Vogue*, ©1949, Condé Nast Publications, Inc.]

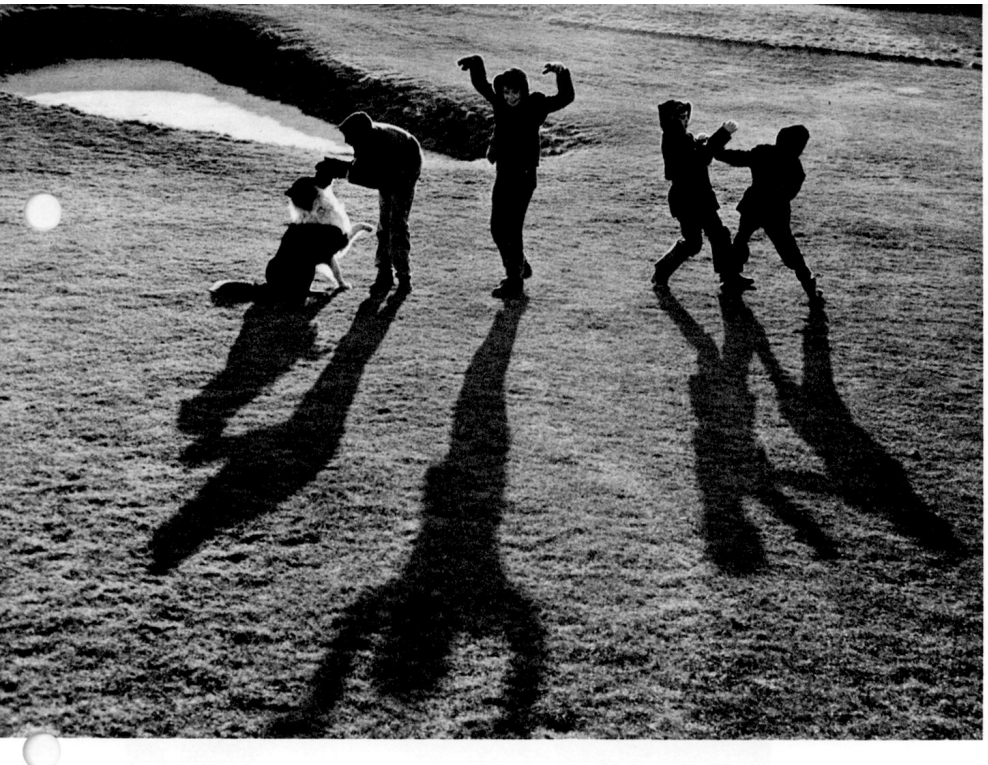


Overlapping foreground objects

You can use depth in a creative way by overlapping your center of interest with objects in the foreground–as Alfred Eisenstaedt did in this picture of mathematician Norbert Wiener. The chairs appear large because they are near the camera. We don't see them in their entirety; we seem to be so close that part of each is outside our field of vision. [Incidentally, if Eisenstaedt had not cropped them, they would compete with the figure.]

But the chairs do more than give us a sense of being right there in the classroom with Dr. Wiener. They provide strong lines of direction, leading our eye back to him. Note that this movement back in space is stopped by the blackboard immediately behind Dr. Wiener, so that our attention is forced to stay where it belongs, on the center of interest.

Eisenstaedt also used value contrast to emphasize his center of interest. See how the strong light on the face contrasts with the shadow side of the head and the blackboard in back.
[Courtesy *Life* magazine, ©Time, Inc.]



Shadows

Shadows cast along a plane such as the ground, a floor, or tabletop can also create a strong sense of depth. In this photograph by Alfred Eisenstaedt, for example, the long tapering shadows cast by the children carry our eye back sharply from the foreground into the picture and to the figures in the middle distance. These cast shadows are also important compositional elements which create shapes that actually provide the only appreciable interest in the lower two thirds of the photograph.

Where you use shadows like these as a compositional device, be careful that they don't lead the viewer's eye out of the picture or detract from the center of interest.

This picture, taken with the sun in the background, shows an interesting use of backlighting. The strong backlight illuminates the edges of the figures, making them "pop" out from the background. It also emphasizes the texture of the grass in the foreground. [Courtesy *Life* magazine, ©Time, Inc.]

Atmospheric perspective

This photograph takes advantage of some of the same devices we have seen in the other pictures on this and the preceding three pages—change in the size of figures with distance and the overlapping of faraway objects by foreground objects [the tree and foliage]. In addition, Eisenstaedt uses the curve of the walk and the plane of the water to set up a movement in depth which carries our eye into the picture and beneath and beyond the bridge.

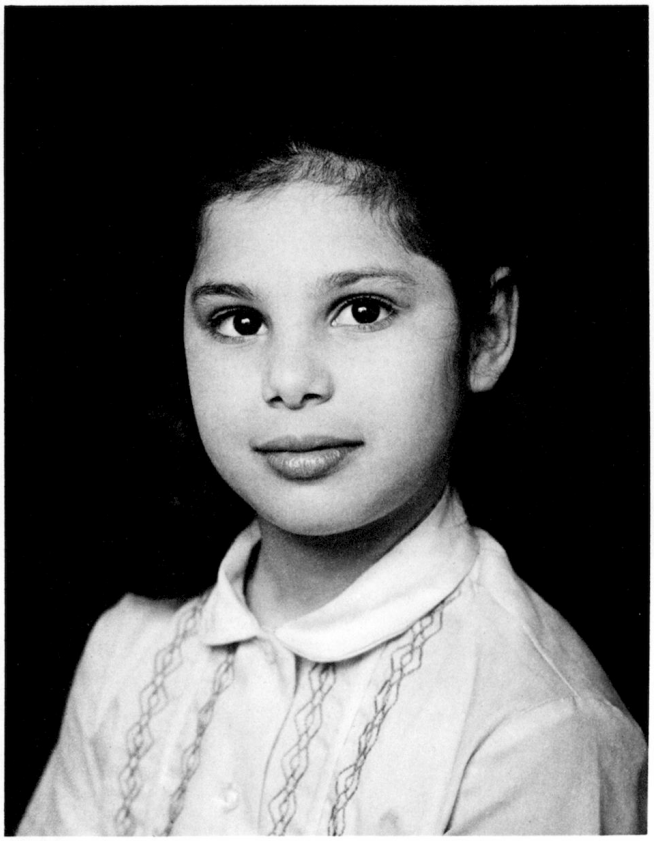
There is still another visual clue to distance here—atmospheric perspective. This is the effect produced by dust, smoke, and other particles in the air, which scatter or diffuse the light, so that far-off objects appear lighter and less distinct than near ones. We see this effect best in the background—the trees and buildings beyond the bridge appear very light in relation to the things in the middle distance and foreground. Notice the strong value contrast between the tree in the foreground and the distant buildings. Atmospheric perspective serves a very useful purpose here, enabling the photographer to include the identifying skyscraper background of New York's Central Park and subordinate it so that it does not interfere with the basic theme of people relaxing and enjoying themselves in the park.

Backgrounds

The background deserves special attention when you compose your pictures. By background we don't necessarily mean a single surface such as a wall in back of the subject–we mean *anything against which the center of interest is seen.* The background is the group of elements around and behind the principal object in the picture area.

You must make sure that the background does not blend or merge in value or shape with the center of interest. For instance, don't pose a person against a curtain of the same value so that his face seems to blend into it. If there's a vase of flowers in the background, take care that they don't appear to be growing out of his head. You must also make sure that details in the background are not so distinct and interesting that they attract the viewer's attention away from the subject.

In general, to make your center of interest show up clearly, keep the background simple. When you can choose the background–as in the studio–provide adequate value contrast between subject and background. When you can't change the background itself, use camera position and careful focusing to control the subject-background relationship. The accompanying Faculty photographs show you how to apply these various techniques.



Value contrast

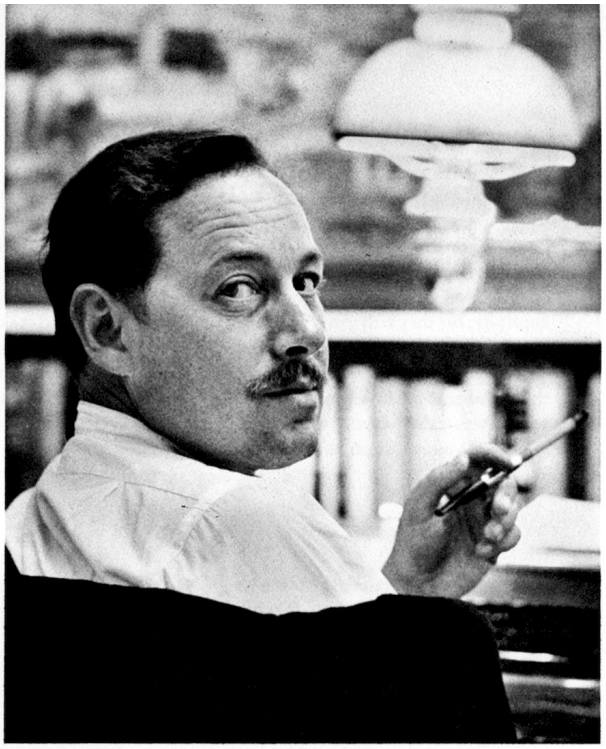
A common mistake is to photograph an object against a background of similar value. Because of the lack of contrast, the two blend together and we lose the shape of the object. Harry Garfield demonstrates this effect and how to avoid it in this pair of portraits.

In the picture at the top, the girl's hair is almost the same value as the background and we lose any separation between the two. Sometimes, of course, you may plan this effect in order to concentrate attention on the face and expression. However, make certain that the mood suggested by the surrounding darkness is appropriate to your subject.

As a rule, particularly in children's portraits, it is more pleasing and desirable to see the subject's head completely. By placing the child against a background of a different value–as in the bottom photograph–you can achieve strong enough contrast to make the hair stand out clearly. Notice that the more subtle difference between the background and the girl's blouse provides distinct separation between the two.

Simplicity

In this photograph of Marilyn Monroe leaping, Philippe Halsman wanted the simplest possible background; he used a plain wall in his studio. Photographers often use a bare wall or, alternatively, a roll of white or light gray seamless paper as a background. Seamless paper comes in rolls of several widths, is inexpensive, and is easy to set up or replace if it becomes dirty. Tape it to the wall [or hang it from a support] and you can create an adequate background in almost any room. [Courtesy *Life* magazine, ©Time, Inc.]



Focus

Backgrounds can be a problem when you're shooting candid pictures indoors because you can't always find a bare wall or uncluttered area conveniently located for your purpose. The answer is to focus carefully to keep the main subject sharp while blurring the background. This softens distracting details and makes them work with, rather than against, the composition.

See how Alfred Eisenstaedt used selective focus in this informal portrait of playwright Tennessee Williams to play down a bookcase, lamp, and painting behind the subject's head. Instead of competing with the face, they now are a subdued part of the overall composition. [Camera position, too, helps in controlling objects in the background. If Eisenstaedt had been farther left, the lamp would appear to grow out of Williams' head.]

Selective focus also serves to direct attention. It's physically much easier to look at a sharp image than a blurred one. Here the principal object is the only one that's sharp, which helps us to concentrate on it. [Courtesy *Life* magazine, ©Time, Inc.]

Camera position

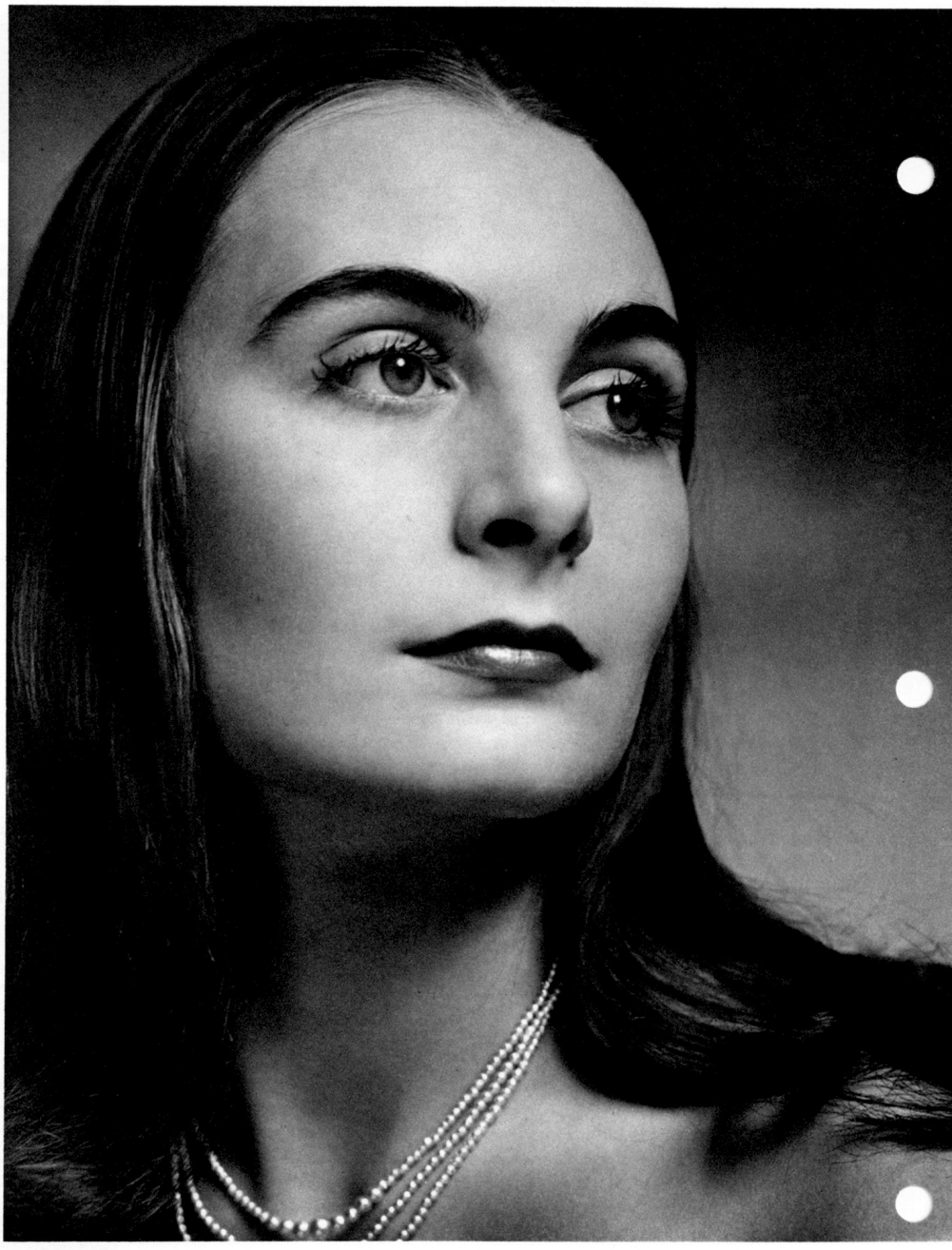
When you're shooting outdoors, bare sky or a plain expanse of sea, sand, or grass often makes a good background. For this fashion picture, taken in Paris, Richard Avedon shot from a low camera position. This moved confusing details down behind the three models and placed much of their dark figures against an empty sky. The shapes of hat, umbrellas, and interlocking arms stand out distinctly. However, Avedon has included just enough subdued, out-of-focus background detail at lower right [and the ornate row of street lamps at left] to suggest the location. When you're at a loss for a good background outdoors, get low, tilt the camera up, and use the sky. [Courtesy *Harper's Bazaar*]

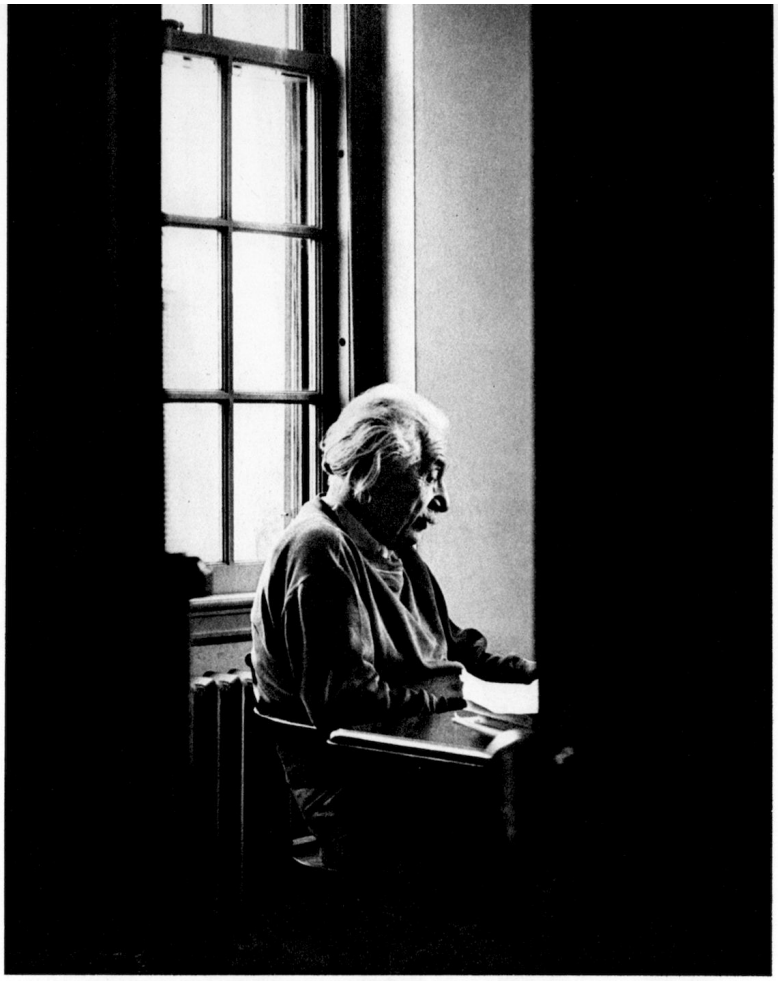
Compositions for study

Here and on the following pages are photographs by members of your Guiding Faculty. Each picture embodies many or all of the principles of composition we have demonstrated in this lesson. Study these examples carefully, for they will give you practical insights into how to make the four basic elements–picture area, value, lines of direction, and depth–work together in your own photographs. Although we have discussed these elements separately to make each point more clearly, they overlap each other, and it's best to consider them simultaneously as parts of a whole–the picture itself and the effect you want it to produce.

This lovely portrait of Ricki Soma by Philippe Halsman shows an effective use of the four elements of composition in a close-up view. Halsman has made the subject fill the picture area in a well-balanced but interesting way by his choice of camera angle and shooting distance, and by cropping. The oval face dominates the picture area but doesn't seem crowded. Halsman placed it high and to the left, leaving enough space for the subject to "look into." [Notice the variety in the size and shape of the areas around the head.] The slightly lower-than-eye-level camera angle suggests height and dignity–qualities which Halsman wished to suggest about his subject. The lines of the hair and necklace set up a rhythmic oval movement which keeps leading our eye around the head.

The overall value scheme is light against dark and middle tone, and the pleasing contours of the face are clearly defined. Highlights on the pearls, the lower lip, and in the eyes add brilliance to the picture. The lighting is natural looking and in keeping with the quiet dignity of the subject. It creates soft shadows under the eyebrows, nose, lips, and chin which model the face and accentuate its lovely bone structure. All the elements of composition work together here to produce a unity, a completeness, and a classic simplicity that is also a comment on the person portrayed.





A middle camera distance was used by Alfred Eisenstaedt for this photograph of Albert Einstein. At this distance we are close enough to see the man clearly, yet we are far enough away to see significant, story-telling details of his surroundings. The strong dark areas at left and right—part of the outer wall and door—frame the seated figure and suggest that we are seeing him in a natural, unposed situation. See how carefully he is placed within the center strip—the compelling vertical lines in the window frame and wall point directly to him. All the lines in this simple room are hard and severe—the only curved ones in the photograph are in his form, making it stand out still more. The stark lighting, as it falls on the wall and figure, helps create a mood of quiet concentration and isolation that seems a visible, outer expression of the scientist at work. [Courtesy *Life* magazine, ©Time, Inc.]

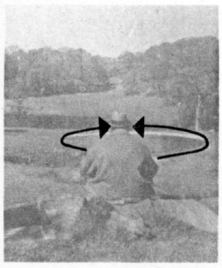
When the full scope of an action and its locale are important you may need great camera distance to tell the whole story. For a dramatic, panoramic view of this waterfront fire in Brooklyn, Joseph Costa went up in an airplane. It was the only way to get the height and distance of camera position necessary to show all the important elements in a clear, dramatic relationship.

From this aerial vantage point we can see these elements at once—the burning ship being towed away by tugs at lower left, the pier surrounded by fireboats in the middle distance, and city towers in the background. The clouds of white and gray smoke drifting across the picture area set up a strong diagonal movement which creates a feeling of action and drama; they also lead our eye back and forth between the burning pier and ship. The lighter clouds of smoke and the white streams of water from the hoses stand out strongly because of value contrast with surrounding areas. The piers at right form more diagonal lines, adding to the sense of excitement and pointing toward the ship being towed away.
[Courtesy New York *Daily News*]

How Philippe Halsman uses camera position

A high camera position gave Halsman this dramatic view of the entrance to one of the United Nations buildings in New York City. By emphasizing vertical lines, he suggests the soaring height of the structure; notice that these lines *converge* toward the bottom, creating the effect of perspective *in height* rather than depth. The small figures help, too. Their different groupings give an otherwise balanced picture some variety and add human interest, but most of all they give an indication of *scale* which intensifies the impression that we are looking down from a considerable height. The strong horizontal lines of the entrance provide a good, solid base for the verticals, and so does the dark checkerboard pattern at the bottom.

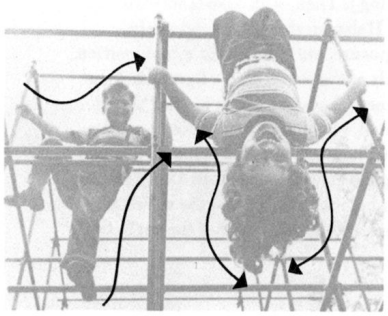
This striking picture, in which composition plays such a major part, was used as a cover on *Life* magazine.
[Courtesy *Life* magazine, ©Time, Inc.]



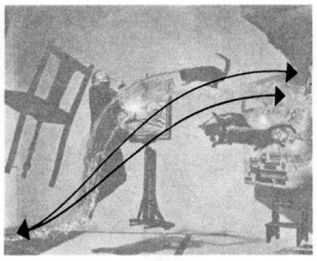
Halsman chose an unconventional camera position for this famous photograph of Winston Churchill. On assignment for *Life*, Halsman visited the statesman at his home in Chartwell, England. "Churchill played a kind of cat-and-mouse game with me," Halsman says. "Whenever he saw me trying to shoot him from the front he would turn away. So when I saw him sitting on a rock I approached him from behind and took the picture." A view from the back might not be recognizable with most subjects, but in Churchill's case Halsman rightly felt the broad, indomitable expanse of back was characteristic of the man.

There are no other objects of strong enough interest to compete with Churchill's massive back. Its shape and its position in the foreground, close to the center of the picture, instantly attract and hold our attention. As emphasized in the diagram, the rim of the pool also works nicely to draw our eye directly to the head of the great man.
[Courtesy *Life* magazine, ©Time, Inc.]

A low camera position gives us a child's own view of children at play on monkey bars in this shot which Halsman made for an advertising client. The upside-down girl dominates because of her unusual position, and also because she is the largest object in the picture area and is seen in sharp focus. Her arms form diagonal lines of direction leading to her face. The boy's figure is subordinate but balances the composition well; he gives interest to an area that might otherwise be monotonous, and his smiling glance directs our attention back to the girl. The bars converge toward the top, emphasizing the feeling of height. The low viewpoint makes it possible to have the empty sky as a background. As the diagram shows, the curving outlines of the children contrast sharply with the straight, rigid bars.
[Courtesy Savings and Loan Foundation, Inc.]

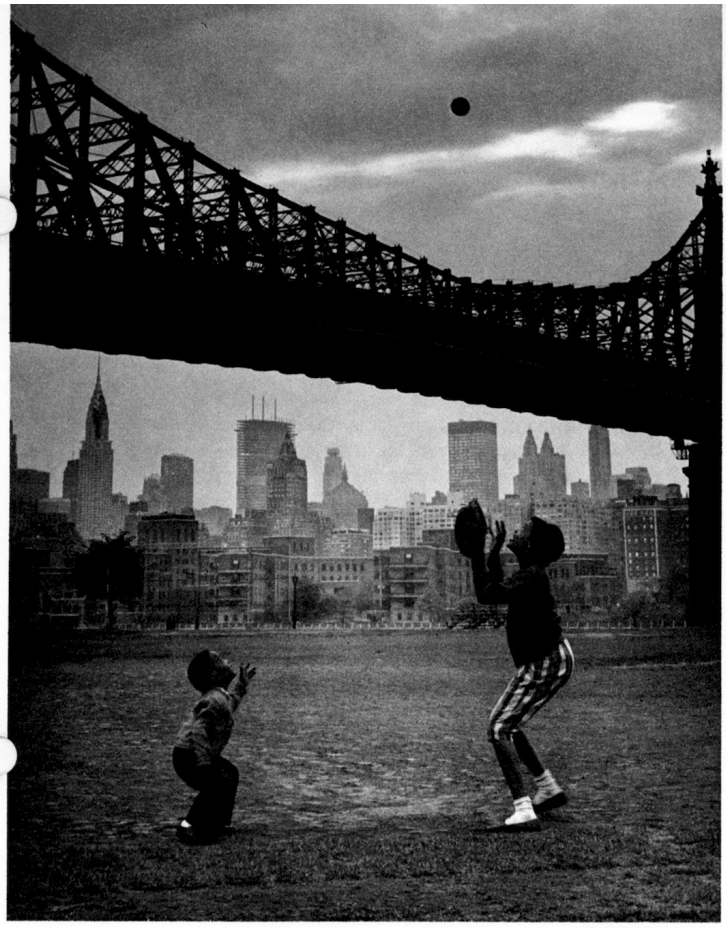


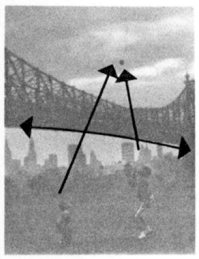
Composition by catching the exact instant



One of the most famous–and wildly improbable–"exact instant" photographs ever made is Philippe Halsman's picture of Dali and the flying cats. Halsman wanted to show Dali with his new painting *Leda Atomica* [*right*], in which every object is floating through the air in contradiction to the laws of gravity–and to achieve this same effect in his photograph.

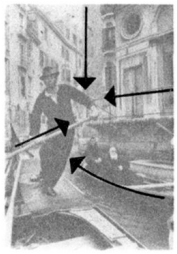
First Halsman suspended the pieces of furniture, *Leda Atomica*, and the easel [holding a second painting]. Then, with assistants throwing cats and water, and Dali leaping, Halsman shot again and again, developing the film after each exposure, until he caught a composition which satisfied him. The diagonals of the chair, Dali's figure, and the cats give abrupt accents of movement that suggest the weird, "flying apart" quality that Halsman wanted, while the sweeping curve of the water ties the elements together. Of course, a critical factor in creating this unusual picture was choosing the exact instant when Dali's leaping figure and the cats were in proper balance. Notice that the raised tail of one of the cats almost perfectly repeats the raised tail of the cat in the center painting!





Harry Garfield's photograph of two Manhattan children playing catch is another good example of the crucial role timing can play in photographic composition. The ball itself, caught at the peak of its rise, creates the illusion that it is higher than the bridge. Notice how boldly the dark ball stands out against the sky. If this small detail were obscured or lost, the entire picture would become meaningless! Psychological lines of direction also pull our eyes to this important detail; the children have their eyes fastened on it, and we irresistibly follow their gaze. So strong is the relationship between the two children and the ball that our eyes tend to follow the triangular path touching these three elements in spite of the strong horizontal movement of the bridge and the row of buildings.

The photograph has a feeling of depth because of the arrangement of the picture elements—the children in the foreground, the bridge in the middle ground, and the buildings in the distance. The buildings are recorded light in value because of atmospheric haze, and this strengthens the sense of distance.



When you take pictures of unposed action, the relationships of figures and objects keep changing. Your viewfinder is like a kaleidoscope in which new arrangements and patterns continuously appear and disappear. If you are quick enough, you can catch the composition that expresses the essence of the subject, as Alfred Eisenstaedt did in this photograph of a canal in Venice.

The most important object, the gondolier, stands out strongly because of value contrast; his figure is considerably darker than surrounding areas. The lines of the oars, the balcony and railing at right, the lines in the buildings behind him, and the two gondolas all lead our eyes to his figure.

Eisenstaedt shot to catch the gondolier as he thrust forward, his body curved, his weight full on the oar and his forward foot. We can feel the grace of his movements. He stands to one side of the picture area, but is balanced by the two small dark figures in the second gondola. Cover them up and see how unbalanced the picture seems without them. These shifting elements have been caught at the exact instant they came together to produce a clear, well-organized picture.
[Courtesy *Life* magazine, ©Time, Inc.]

Practicing composition

Composition is one of the most exciting and creative parts of your work as a photographer. When you compose you take the raw material of your subject and transform it into a meaningful picture. All of your knowledge and judgment is brought into play. You must be a stage director, an artist, and a photographer all in one.

Composing a photograph can be a subtle and delicate technique—sometimes only a few changes will turn a mediocre composition into an excellent one. The best way for you to master this technique, to make good composition habitual and eventually almost instinctive, is to study the principles of composition explained in this lesson until you have them firmly and clearly in mind. Then consciously apply them every time you make a photograph.

Remember, these principles are not hard-and-fast rules, but guides to help you put together your photographs more effectively. Composition is personal and creative. Each picture has its own needs and requires decisions that only you, the photographer, can make.

Learn to use picture area competently, by exploring and trying different effects until you can arrange things in a clear, interesting, well-balanced way. Experiment with the size of the subject in relation to picture area and other objects so that you are sure it has the importance you want. See how you can use various lines of direction—actual, psychological, or implied—to guide your viewer's eyes to key details and keep his interest from straying outside the picture. Try values in various combinations and arrangements until you know how to make them work in establishing mood, attracting attention, and clearly defining the subject. Practice different arrangements in depth, too, using the visual clues that give a strong sense of three-dimensional space in your photographs. Only by constant experiment and exploration can you acquire a thorough understanding of the principles of composition and learn how to make them work for you.

You can also increase your knowledge of composition by studying photographs at every opportunity. Throughout your Course, there are pictures by your Guiding Faculty. Identify the purpose of each picture and then analyze the composition to see how it supports the purpose. Do the same with published photographs. And, above all, do the same with your own photographs.

Composition and the art of seeing

Composition is one of the most important methods you have of getting other people to see the world through your eyes. Actually, seeing and composing are inseparable for a creative photographer. Just as it is difficult to "think" [except in a crude, limited way] without organizing our thoughts into words and sentences, so it is impossible to make a photograph that communicates with precision and strength unless we know how to organize the picture elements in a logical, forceful way.

One thing that sometimes seems to make composition needlessly difficult for beginners is the realism of photography itself. In looking at a subject through a viewfinder, or studying a photograph, it's easy to become so interested in the meaning of what you see that you lose sight of composition. Therefore, a basic step in improving your ability to compose is to train yourself to see the purely *visual* aspect of things—the way things *look*, regardless of the meaning or purpose we commonly associate with them.

For example, when you look at an apple, you must view it not just as an edible fruit, but also as a rounded shape with glistening surfaces streaked with warm reds and yellows. It means seeing the highlights and shadows that give the apple an appearance of substance and three-dimensional form. And it means seeing how this rounded shape relates to the background and neighboring shapes.

To take another example, imagine you are photographing a small boy. You are aware that this is Johnny Jones, age nine—a happy child in a Little League suit. You are aware of his smiling expression and the emotion it suggests. But, as a good photographer, you see what an ordinary person might miss. You see Johnny in purely visual terms, too—as a rather complex vertical shape having a certain tonal value. You see his bat, not only as a bat, but also as a long, narrow shape that extends outward at a certain angle from the body. And you're aware of the background behind him as an area that either blends in with his shape or makes it stand out clearly.

As an aid to this kind of purely visual seeing, photographers sometimes turn a picture upside down when studying its composition. When you stand the picture on its head, the subject matter becomes less recognizable and distracting, and it's often easier to see the picture as a *composition.*

We're not recommending that you turn all of your pictures—or yourself when taking them—upside down. But it is most important that you do practice the kind of seeing we have described. This should not be difficult if you make a conscious effort to observe shapes, values, lines of direction, patterns of light and shadow, etc., each time you take pictures. Eventually, you'll be aware of these things without making the conscious effort.

Composition versus subject matter

In doing your assignments for this lesson you may be concentrating on composition more than you ever did in your picture-taking before. This is as it should be, because composition is vitally important in every photograph you make.

However, remember that composition by *itself* is rarely enough. A photograph that has only composition to offer us usually seems sterile and empty. It may have a great deal of visual impact at first glance, but we tend to quickly grow tired of looking at it. Nor should composition be mere decoration, like frosting on a cake. It should support the subject of the picture. It should be the structure that organizes all the elements of the picture so that they clearly express the mood or meaning you want to convey.

Your picture idea does not have to be earth-shaking in its importance. It might be as gentle as the quiet strength of a sand dune or the loveliness of a young girl. It can be as light-hearted as the gaiety of children on a merry-go-round. It might be the power of a tractor or the impressiveness of a new building.

The important thing is to find the composition that best serves this picture idea. Don't leave it up to the viewer to discover your subject among confusing and irrelevant details or poorly arranged picture elements. *Use the powerful tools of composition to get your meaning across quickly and forcefully.* Once you have learned to do this, you are truly "speaking" the picture language of photography. It is one of the most rewarding—and necessary—skills you can acquire as a photographer.

Technical notes on the photographs

Page 2
Richard Avedon; Rolleiflex with an 80-mm *f*/2.8 lens; Plus-X film; 1/125 second at *f*/11; daylight.

Page 2
Irving Penn; Leica with a 150-mm lens; medium-speed film; 1/25 second at *f*/11; daylight.

Page 2
Richard Avedon; Rolleiflex with an 80-mm *f*/2.8 lens; Plus-X film; 1/60 second at *f*/5.6; daylight.

Page 2
Bert Stern; Rolleiflex with an 80-mm *f*/2.8 lens; Plus-X film; 1/2 second at *f*/8; daylight.

Page 2
Philippe Halsman; Fairchild-Halsman 4x5 camera with a 210-mm *f*/4.5 lens; Super Panchro-Press, Type B film; exposure for electronic flash at *f*/32; electronic flash.

Page 4
Alfred Eisenstaedt; Leica with a 35-mm lens; Super-XX film; 1/25 second at *f*/11; daylight.

Page 5
Victor Keppler; Nikon F with a 105-mm lens; Plus-X film; 1/125 second at *f*/16; daylight.

Page 6
Alfred Eisenstaedt; Leica with a 35-mm lens; Plus-X film; 1/100 second at *f*/16; daylight.

Page 9
Victor Keppler; Mamiyaflex C with a 180-mm *f*/4.5 lens; Plus-X film; 1/200 second at *f*/11; daylight.

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Alfred Eisenstaedt; [*both pictures*] Leica with a 35-mm lens; Super-XX film; 1/25 second at *f*/8; daylight.

Page 14
Harry Garfield; 3¼x4¼ Super D Graflex with a 6-inch lens; Panatomic-X film; exposure for electronic flash at *f*/22; electronic flash.

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Alfred Eisenstaedt; Leica with a 90-mm lens; Plus-X film; 1/125 second at *f*/22; daylight.

Page 15
Philippe Halsman; Fairchild-Halsman with a 210-mm *f*/4.5 lens; Super Panchro-Press, Type B film; exposure for electronic flash at *f*/22; electronic flash.

Page 17
Richard Avedon; Rolleiflex with an 80-mm *f*/2.8 lens; Tri-X film; 1/60 second at *f*/8; floodlight.

Page 18
Irving Penn; 4x5 view camera with a 90-mm lens; Ektachrome Daylight Type film; 10 seconds at *f*/16; daylight.

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Alfred Eisenstaedt; Leica with a 35-mm lens; Super-XX film; 1/10 second at *f*/5.6; available light.

Page 19
Richard Avedon; Rolleiflex with an 80-mm *f*/2.8 lens; Plus-X film; 1/125 second at halfway between *f*/8 and *f*/11; daylight.

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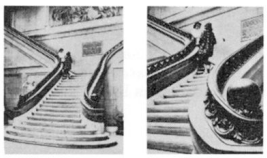
Philippe Halsman; Rolleiflex with a 75-mm *f*/3.5 lens; Super-XX film; 1/25 second at *f*/5.6; daylight.

Page 20
Irving Penn; Leica with a 150-mm lens; Super-XX film; exposure for electronic flash at *f*/32; electronic flash with a snoot.

Page 21
Irving Penn; Rolleiflex with a 75-mm lens; Verichrome film; 1 second at *f*/8; daylight.



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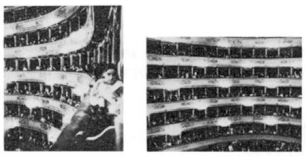
Alfred Eisenstaedt; [*both pictures*] Leica with a 35-mm lens; Super-XX film; 1/25 second at *f*/16; daylight.



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Alfred Eisenstaedt; [*both pictures*] Leica with a 35-mm lens; Super-XX film; 1/2 second at *f*/16; available light.

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Ezra Stoller; 8x10 Sinar with a 6½-inch lens; Super Panchro-Press, Type B film; 1/5 second at *f*/32; G filter; sunlight.

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Philippe Halsman; Rolleiflex with a 75-mm *f*/3.5 lens; Tri-X film; 1/50 second at *f*/6.3; daylight.

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Victor Keppler; Mamiyaflex C with an 80-mm *f*/2.8 lens; Plus-X film; 1/100 second at *f*/22; daylight.

Page 27
Richard Avedon; 8x10 Deardorff with a 12-inch lens; Super-XX film; 1/10 second at *f*/5.6; floodlight and available light.

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Ezra Stoller; 4x5 Sinar with a 4⅝-inch lens; Tri-X film; 1/10 second at *f*/32; daylight.

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Irving Penn; 4x5 Deardorff with a 5-inch lens; Super-XX film; 2 seconds at *f*/22; available daylight and available electric room light.

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Alfred Eisenstaedt; Rolleiflex with an 80-mm lens; Super-XX film; 1/10 second at *f*/16; available light.

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Alfred Eisenstaedt; Leica with a 35-mm lens; Plus-X film; 1/250 second at *f*/16; sunlight.

Page 31
Alfred Eisenstaedt; Leica with a 35-mm lens; Plus-X film; 1/250 second at *f*/22; sunlight.

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Harry Garfield; [*both pictures*] 4x5 Gowlandflex with an 8¼-inch lens; Panatomic-X film; exposure for electronic flash at *f*/8; electronic flash.

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Philippe Halsman; Rolleiflex with a 75-mm *f*/3.5 lens; Tri-X film; exposure for electronic flash at *f*/22; electronic flash.

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Alfred Eisenstaedt; Leica with a 50-mm lens; Super-XX film; 1/10 second at *f*/4.5; available lamplight.

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Richard Avedon; Rolleiflex with an 80-mm *f*/2.8 lens; Tri-X film; 1/125 second at *f*/11; daylight.

Page 34
Philippe Halsman; Fairchild-Halsman with a 210-mm *f*/4.5 lens; Portrait-Pan film; 1/5 second at *f*/8; floodlight.

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Alfred Eisenstaedt; Rolleiflex with a 75-mm *f*/3.5 lens; Super-XX film; 1/25 second at *f*/8; available daylight.

Page 35
Joseph Costa; 5x7 Fairchild aerial camera with a 10-inch lens; Super Panchro-Press, Type B film; 1/400 second at *f*/8; daylight.

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Philippe Halsman; 4x5 Meridian with 90-mm *f*/6.8 lens; Super Panchro-Press, Type B film; 1/10 second at *f*/8; diffused daylight and building lights.

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Philippe Halsman; Rolleiflex with a 75-mm *f*/3.5 lens; Super-XX film; 1/100 second at *f*/8; sunlight.

Page 37
Philippe Halsman; Rolleiflex with a 75-mm *f*/3.5 lens; Tri-X film; 1/50 second at *f*/5.6; diffused daylight.

Page 38
Philippe Halsman; 4x5 Meridian with 127-mm *f*/4.7 lens; Super Panchro-Press, Type B film; exposure for electronic flash at *f*/16; electronic flash.

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Harry Garfield; Rolleiflex with a 75-mm *f*/3.5 lens; Plus-X film; 1/100 second at *f*/8; overcast daylight.

Page 39
Alfred Eisenstaedt; Leica with a 35-mm lens; Plus-X film; 1/50 second at *f*/22; daylight.

Famous Photographers Course
Famous Photographers School, Inc., Westport, Connecticut

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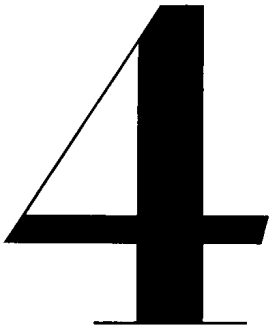

Black-and-white photography

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Black-and-white photography

Many of the world's greatest photographs have been made–and will continue to be made–in black and white. All the great photographers of the past worked in this medium, as do many photographers today, including members of your Guiding Faculty. There are three good reasons for this enduring use of black-and-white photography–and for you to acquire skill in handling the medium. These reasons are the rich opportunities it offers in *markets*, *creativity*, and *control*.

The majority of the photographs we see printed on the pages of newspapers, magazines, books, and other publications are reproduced in black and white, for it is considerably less costly than color reproduction. Black-and-white photography has widespread applications in advertising, industry, education, portraiture, and many other fields. Because of the enormous demand and numerous uses for black-and-white photography, it is likely to be the door by which a beginner enters the ranks of the professionals. To become a versatile photographer, you'll need to master the basic techniques of the medium.

While the use of color has increased, and no doubt will continue to do so, there is little reason to believe that color photography threatens to completely supplant black and white as a means of creative expression and communication. Color and black and white are two different media, each with its own uses and applications, each filling different needs. Both are part of the universal picture language of photography, but each has its own vocabulary.

A black-and-white photograph can take advantage of the fact that it is a less literal representation of reality than a color picture. By eliminating color, it sometimes can communicate the essence of a subject in a more simplified, powerful way. It sometimes can force us to see aspects of reality–form, texture, the play of lights and shadows, for example–with greater intensity and clarity than we see them in color.

Black-and-white photography can produce effects of rich black against pure white that are as stark and bold as the brushwork of Japanese calligraphy, or it can record delicate gradations of gray with an exactness and subtlety that no human hand could duplicate. Not only is it a descriptive medium, able to record details with masterly precision, but it also can create strong emotional effects. One of its great assets in this respect is its ability to show the infinite variety of light itself, and to use the power of illumination and shadow, of brightness and darkness, to evoke a response in the viewer.

As you study this and other lessons in the Course, you'll find that black-and-white photography offers a high degree of creative control, not only when setting up the picture and making the exposure, but also in the darkroom when developing the film and making prints. A black-and-white photograph communicates its message with values of black, white, and gray. By your skill in controlling these values, you can emphasize what is important and subdue what is unimportant in your pictures. You can intensify mood and convey emotion. As you improve your ability to control values you'll find that the black-and-white image is not a limitation to expression, but a source of strength.

The techniques of black and white

Our purpose here is to help you make better pictures in this important creative medium–to translate more effectively what you see into the accomplished reality of a black-and-white print. No single lesson can cover everything you should know about so varied and flexible a process, but we will explain and demonstrate the basic techniques that you need right now and will continue to use in future lessons.

First, there's the essential matter of choosing the right *film* for your particular purpose. We'll describe and show key characteristics of films and help you to select the types that are most appropriate for different kinds of pictures.

Next, we'll give you some practical facts about *filters*–how you can use these helpful camera accessories to control the values in your pictures, so you can get more natural-looking skies and more pleasing skin tones, and darken or lighten different objects.

Then we'll show you how to use an *exposure meter* in a variety of lighting situations you're likely to encounter in your shooting. Unless your film is properly exposed, you won't get a good negative, and without a good negative you will find it difficult or even impossible to get a good print. Therefore, knowing how to expose accurately is an essential skill, and should be mastered as quickly as possible.

Finally, we'll demonstrate how to *develop* film. During this important step of the photographic sequence the exposed film is processed in special chemical solutions which convert the invisible "latent" image into permanent visible form. The result of developing is a photographic negative [like the one shown in the left half of the picture on the facing page]. This negative contains an image of the subject in which all the tones are reversed from what they were in the subject–dark areas become light and light areas become dark. The negative is the all-important "master," from which you will learn to make prints converting the values back to their normal relationship.

This final step in black-and-white photography–making a print–is so important that it requires separate treatment. We'll cover the fundamentals of black-and-white printing in your next lesson.

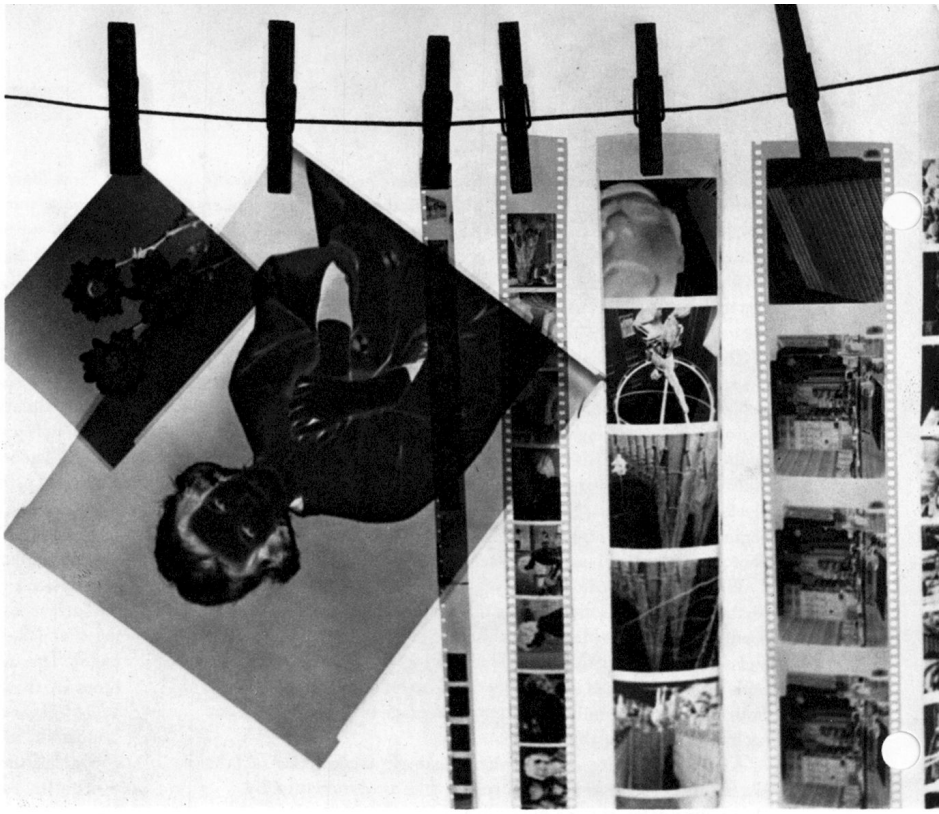
Developing your own film

If you develop your own film, the experience you gain can deepen your understanding of the entire photographic process. It can give you greater control, and sharpen your ability to make accurate, informed decisions about exposure.

In addition to these advantages, there's the matter of cost and convenience. It's true that many busy professionals in large cities don't have time to do the bulk of their own darkroom work. They may "farm out" much of it to a processing lab or a darkroom specialist. However, this may be a costly procedure, depending on the volume of your work. Also, outside of a few major cities, it may be difficult to find photofinishers or processing labs that can turn out work with the speed and quality a professional requires. Therefore, you'll be wise to learn how to process film yourself. Certainly, during the remainder of this Course, you should find it generally more economical and satisfying to do your own black-and-white darkroom work, and we strongly recommend that you do so.

When studying this lesson, keep in mind that all the steps in the photographic process are interrelated. Each step leads to the final print. For example, the way the film should be exposed depends on the light and the subject; the way the film should be developed depends on the exposure; and the resulting negative is the basis of the picture that people will see. There is only one way by which you can make this picture most fully express what you want it to. That is by learning to control each step of the process. You can acquire this skill, not just by reading about the methods of black-and-white photography, but by actually applying them to the picture you make with *your* particular film and camera. Remember–you learn photography by taking pictures!

[*Facing page*] In black-and-white photographs the subject is recorded on film as a "negative" with its values reversed, as shown in the left half of this picture. What is *light* in the subject becomes *dark* in the negative, and vice versa. From this negative a print is made which reproduces the subject in its correct tonal relationship, as shown in the right half of the picture. In this lesson dealing with films, filters, exposure, and development, you will learn how to produce the all-important black-and-white negative from which the final picture is made.
[Photograph by Harry Garfield]



Some popular sizes of film are shown here: [*left to right*] 4x5 sheet film, 8x10 sheet film, 16-mm subminiature film, 35-mm film, 120 roll film, 70-mm film, and 127 roll film. Note the perforated edges of the 16-mm, 35-mm, and 70-mm film.

Films for black-and-white photography

Film is the raw material of photography–the substance that captures and permanently holds the image produced by the lens. It's important that you know how to choose the right film for the kind of pictures you want to take. The film you use can affect the quality of the image you get in terms of sharpness, brightness, fine rendering of detail, and the accuracy with which it translates the subject into black and white.

How film works

Every roll or sheet of film you use–no matter what size, type, or brand it is–has two basic parts. First, there is a coating of light-sensitive *emulsion* [composed largely of silver salts suspended in a gelatin]. The emulsion is the layer of material that actually captures the image. Second, there is a transparent support or *base* [usually a flexible acetate material], on which the emulsion is coated.

When you open the camera shutter during exposure, the lens focuses light to form an image on the film. The light strikes the silver salts, causing changes in their basic structure. Where more light falls on the film, more particles of silver salt are affected, and where less light falls, relatively few particles are affected. Through this action, light produces an invisible image [called a latent image] on the film.

If you looked at the exposed film at this point, you would not be able to see any changes in the surface of the emulsion. [Don't try this, of course–looking at the film by light will completely wipe out the latent image, because *all* the silver salts in the emulsion will be affected.] The only way to tell if a latent image has been formed is to *develop* the film, which converts the latent image into a visible negative image.

Film types and sizes

There are three major types of film that you are most likely to use in your career as a photographer: roll film, perforated-edge film, and sheet film. Each type is available in a variety of sizes to fit different sizes of cameras.

Roll film is supplied wound on a spool along with a protective paper backing that protects the film from light as you load and unload your camera. [This paper backing is discarded before you develop the film.] Roll film is available in various sizes designated by number. For example, many simple snapshot cameras use 127-size roll film, while 120 roll film is a popular size for twin-lens reflex cameras.

Perforated-edge film originally was designed for movie work, but it has been adapted and perfected for still photography. It comes in strips with perforations along one or both edges. Sprockets in the camera engage these holes to advance the film after you make each exposure. Still film with sprocket holes is available in several widths–subminiature sizes, 35 mm wide, and 70 mm wide. By far the most popular is 35-mm film. It is available in 20-exposure or 36-exposure lengths loaded in protective metal cartridges, and also can be purchased in bulk for loading into your own cartridges.

Sheet film is used in many of the larger types of cameras. Separate sheets of film are individually loaded into special holders in the dark. The holder is then inserted into the back of the camera, and a protective *dark slide* is removed before you take the pictures. Some of the more common sheet-film sizes are 3 1/4 x 4 1/4, 4x5, 5x7, and 8x10 inches.

Also available for some types of cameras are film packs containing 12 individual sheets of film. The entire pack is loaded into the back of the camera in a special film-pack holder, and a paper tab is pulled to position a new sheet of film after each exposure.

No matter what type or size of film your camera uses, you will find a variety of excellent brands available for it. To help you choose one that will best suit your purpose, let's now take a look at four characteristics common to all films and see how they can affect the pictures you take.

Color sensitivity

Different types of black-and-white film vary in their sensitivity to light of various colors. *Color sensitivity*, as this is called, is important to you as a practical photographer because it affects the way the film translates a color subject into black, white, and shades of gray. Depending on color sensitivity, a film may render a certain color as lighter or darker in value than it appears to your eyes.

Film can be classified into four basic types according to color sensitivity: *blue-sensitive*, *orthochromatic*, *panchromatic*, and *infrared*.

The blue-sensitive films are sensitive only to ultraviolet and blue-violet light. They have commercial uses in the graphic arts for copying, making engraving plates, and producing lantern slides, but you will not generally use them for picture-taking purposes.

Orthochromatic film [often called "ortho" for short] is sensitive to ultraviolet, violet, blue, and green light, but *not* to red light. Therefore, red objects [and orange ones, too, since orange is made up of red and yellow] are recorded relatively darker on ortho film than they appear to your eye. This is because the red light reflected from such objects does not affect the ortho film. It "sees" these objects as if they were dark.

Today, ortho film is generally available in the form of sheet film only. You might choose an ortho film in order to record a red or orange object dark and therefore make it stand out more strongly against a light background. Ortho film sometimes is used in making portraits of men because it tends to record flesh tones somewhat darker, thus emphasizing the skin texture for a more rugged, masculine effect. Sometimes it's used in wedding photography to produce stronger contrast between flesh tones and white clothing. We'll discuss these uses of ortho film in more detail in later lessons.

Panchromatic film [referred to as "pan" film for short] is sensitive to light of *all* colors. It usually produces a "normal"-looking record of the scene or subject photographed. That is, the range of black-and-white values in the photograph will correspond approximately [although not exactly] to the range of light-to-dark values in the scene as your eyes see them. For example, a light red object will be recorded as a light gray, a dark blue object as a dark gray, etc. Although we cannot see the original colors when we look at a black-and-white photograph taken on pan film, we can get a pretty accurate idea of their relative brightness or darkness.

For the great majority of your black-and-white photographs we recommend that you choose a panchromatic film, because it will give a more accurate rendition of subject values into black and white.

Infrared film is a special-purpose film sensitive to infrared rays of light, which are invisible to human eyes. It is most often used for military, astronomical, and scientific purposes.

Two types of color sensitivity

To see how the color sensitivity of a film affects the way it translates color into black and white, look at the accompanying illustrations. Above is a color bar, and at right are two photographic reproductions showing how the colors are recorded as shades of gray by ortho and pan films.

Ortho film: When the color bar is recorded on ortho film, the red block appears very dark, but the remaining colors are reproduced in shades of gray that approximately equal their values as they appear to the eye.

Pan film: A panchromatic emulsion is sensitive to light of *all* colors and therefore records all the colors in the bar in shades of gray that approximately match their natural brightness. Because of this natural-looking result, pan films are more widely used for general picture taking than ortho films.

How pan and ortho film record red

A still life in color: Here's an arrangement of red objects varying in brightness from medium light to rather dark.

Recorded on ortho film: Ortho film, relatively "blind" to red, records red objects as darker than they appear to our eyes. Notice how much darker the tomatoes and the red tablecloth now appear in comparison to the white tablecloth. The darker red objects have gone almost black.

Recorded on pan film: The values here closely approximate the values in the color reproduction. The tomatoes are recorded as medium light gray, and so is the red tablecloth. The darker reds of the ketchup, pepper, apple, onion, and strawberries are recorded as dark gray.

Film speed

After sensitivity to color, a second important characteristic to consider when you choose a film is its "speed." When we talk about film speed we mean its *sensitivity to light* in general. Some films are "slow"–that is, relatively insensitive to light, so that they require a relatively great exposure to produce a satisfactory result. Others can be classified as "medium-speed" films. And still others are considered "fast" or "high-speed" films because they are highly sensitive to light.

The speed of any particular film is indicated by a number called an *exposure index* or *speed rating*. This figure is determined by a standard test procedure established for the photographic industry by the American Standards Association [called ASA, for short].

This ASA exposure index applies *when you give your film normal development as recommended by the manufacturer*, or its equivalent in a developer made by some other manufacturer. The ASA exposure index is listed on the data slip included with your film.

The exposure index is an important number for you to note, remember, and use. For example, when shooting with an "electric eye" automatic exposure camera, you must set the camera at the exposure index of the film you are using. When using a good-quality exposure meter [we'll demonstrate how to use exposure meters later in the lesson], you also need to set the meter dial to the film's exposure index.

For most of the panchromatic films available today, only one exposure index is given. You can use this number whether shooting by daylight or artificial light. However, most orthochromatic [and some other] films have separate exposure index numbers for daylight and artificial illumination. The exposure index to be used with artificial light usually is called a "*tungsten*" *rating*. Generally it will be lower than the daylight reading, because such films are relatively less sensitive to the reddish light of photoflood and studio lamps than they are to daylight, which contains more blue.

How fast a film do you need? The general rule is simply this: *Select a film that's fast enough to do the job at hand, but don't buy speed you can't use.*

For example, a fast film generally is most useful when the light is poor and a slower film would require an inconveniently long exposure. It also can be useful in situations where you want a very fast shutter speed to stop action, or a very small aperture for great depth of field. On the other hand, a medium-fast or slow film usually is more suitable for photography outdoors on a bright day or indoors by flash or flood. Used with extremely bright light, a fast film may cause overexposure.

All films offer a certain *latitude* or margin of safety in exposure. You can overexpose or underexpose to a degree, and still produce a negative that will give you acceptable prints and enlargements. Therefore latitude is valuable when you don't have time to take an accurate exposure-meter reading or are prevented from doing so for some other reason. It sometimes may save a picture when you have to shoot fast or miss the shot altogether. However, best quality comes when you achieve correct exposure. Your goal, whenever possible, should be to expose accurately to produce the particular effect you want in your picture. The proper use and interpretation of an exposure meter is the surest way to accomplish this.

A fast film may be your best choice for subdued light

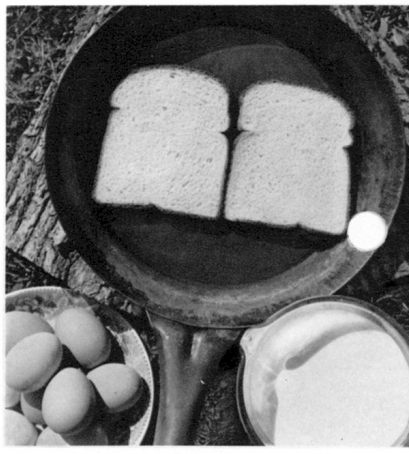
Fast film

The film used for this photograph was rated at ASA 400–a moderately fast exposure index. The only illumination was diffused daylight falling through a curtained window. An exposure of 1/60 second at *f*/3.5 gave the good results shown here.

Slow film

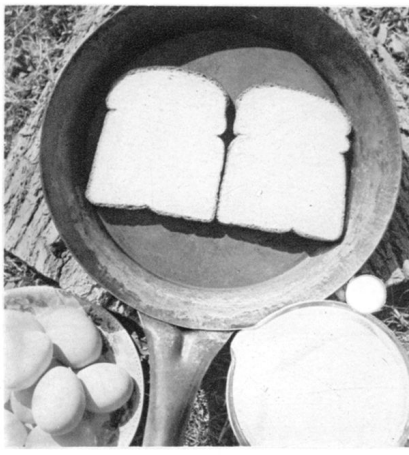
In the same situation a slow film caused a problem. The film chosen for this picture had an exposure index of ASA 50. The photographer used his lens at its widest aperture [*f*/3.5], and shot with the slowest shutter speed he dared hand-hold [1/30 second]. This was the greatest amount of exposure he was able to give under the circumstances. Even so, the picture is underexposed, and the shadows on the boy's face are too dark. A faster film should have been selected here.

A slow or medium-speed film may be your best choice for very bright light



Slow film

This photograph, made in bright sunlight, was taken on a slow film rated at ASA 50. An exposure of 1/125 second at *f*/16 was used to give correctly exposed results, with detail both in highlights and shadow areas.



Fast film

A fast film, with an exposure index of 400, caused problems in this particular bright-light situation. Even when the photographer stopped his lens all the way down to *f*/16 [as far as it would go] and used the fastest shutter speed on his camera–1/250 second–the picture was overexposed. Notice that it lacks detail in the light areas–the bread, eggs, and milk. A slower film would have been a better choice in this case.

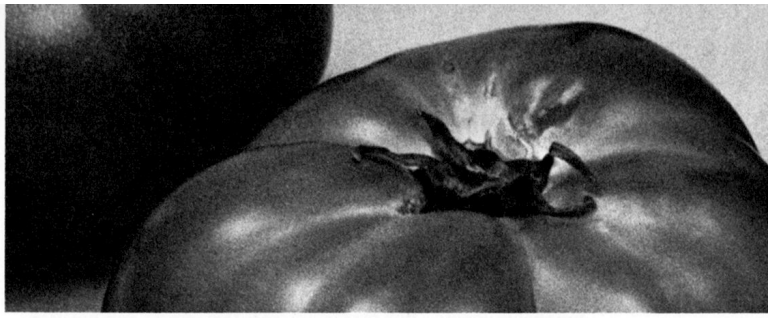
Grain

A third characteristic of black-and-white films is "grain"–the clumping together of tiny particles of metallic silver in the negative. Generally, the *faster* the film, the *more grainy* it tends to be.

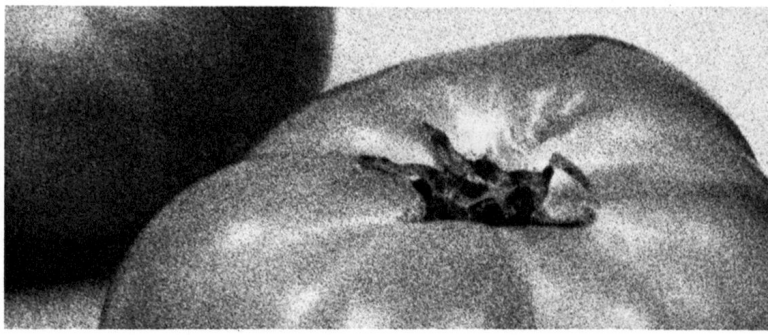
Grain creates a granular [or sometimes mottled] pattern on the negative. Grain is most noticeable when you make a big enlargement from a small negative because it is magnified along with the image. Grain shows up especially in smooth, even areas of light gray or middle gray in an enlargement.

A strong pattern of grain can be distracting. Because it tends to break up the image, it may make your photograph look less sharp than a slower, fine-grain film. Therefore, most photographers generally prefer to keep grain to a minimum.

Since faster films tend to be more grainy, you can minimize grain by using a slow or medium-speed film whenever lighting conditions permit. As we have recommended, save the fast, grainy films for shooting in poor light or other situations where you really need the extra speed.



Enlarged section of a slow, fine-grain film.



Enlarged section of a fast, coarse-grain film.

Contrast

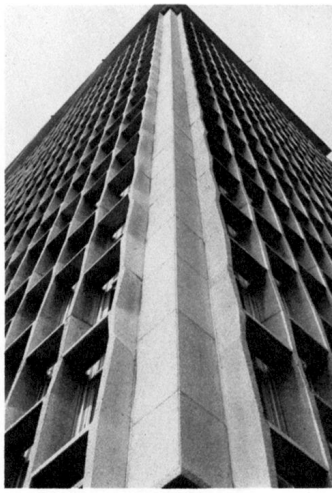
A fourth characteristic of film is contrast. We've already talked about the contrast between light and dark values in the subject, and the contrast between highlights and shadows created by the lighting that falls on a scene. When we talk about contrast as a quality of film, we mean the way the film records a scale of values from light to dark.

For a simple comparison, think of the value range in a negative as a staircase leading from the first to the second floor of a house, with black at the bottom and white at the top. The number of steps in the staircase indicates the number of gray tones the film can record between these two extremes.

A high-contrast film has only a few "steps"–that is, it will record only a limited number of gray middle tones, each differing markedly from the value of the preceding one. A low-contrast film covers the same distance with many shallow "steps"–that is, with a large number of tones, each only slightly different from the value of the one before it.

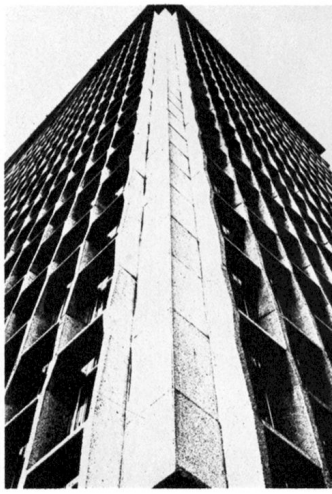
Most of the films you'll use in photography provide more or less normal contrast and can reproduce a wide range of tones between black and white. In general, fast films tend to be slightly "flatter" [lower in contrast] than medium- and slow-speed films, and for that reason sometimes are preferred for use in situations where the subject or lighting has high contrast. However, the difference may be somewhat subtle in terms of practical, picture-taking results.

In addition to the many general-purpose films giving approximately normal contrast, there are a few special high-contrast films designed specifically for copying and other graphic arts work. Sometimes these can be used by a creative photographer to achieve an interesting pictorial effect. As the accompanying photographs show, a very high-contrast film eliminates most of the middle tones in a scene, leaving a pattern of white highlights and black shadows.



Soft light: normal-contrast film

Here's a building photographed in soft outdoor light with a medium-speed film having normal contrast. Notice the subtle gradations of gray middle tones ranging between the darkest shadows and the lightest areas.



Soft light: high-contrast film

Here's the same building, under the same lighting conditions, as recorded on a special high-contrast film. The middle tones have mostly dropped out, leaving a pattern of blacks and whites. If the pattern is interesting, this high-contrast treatment can produce a striking graphic effect. However, for most of your photography you'll probably want a film that produces normal contrast.

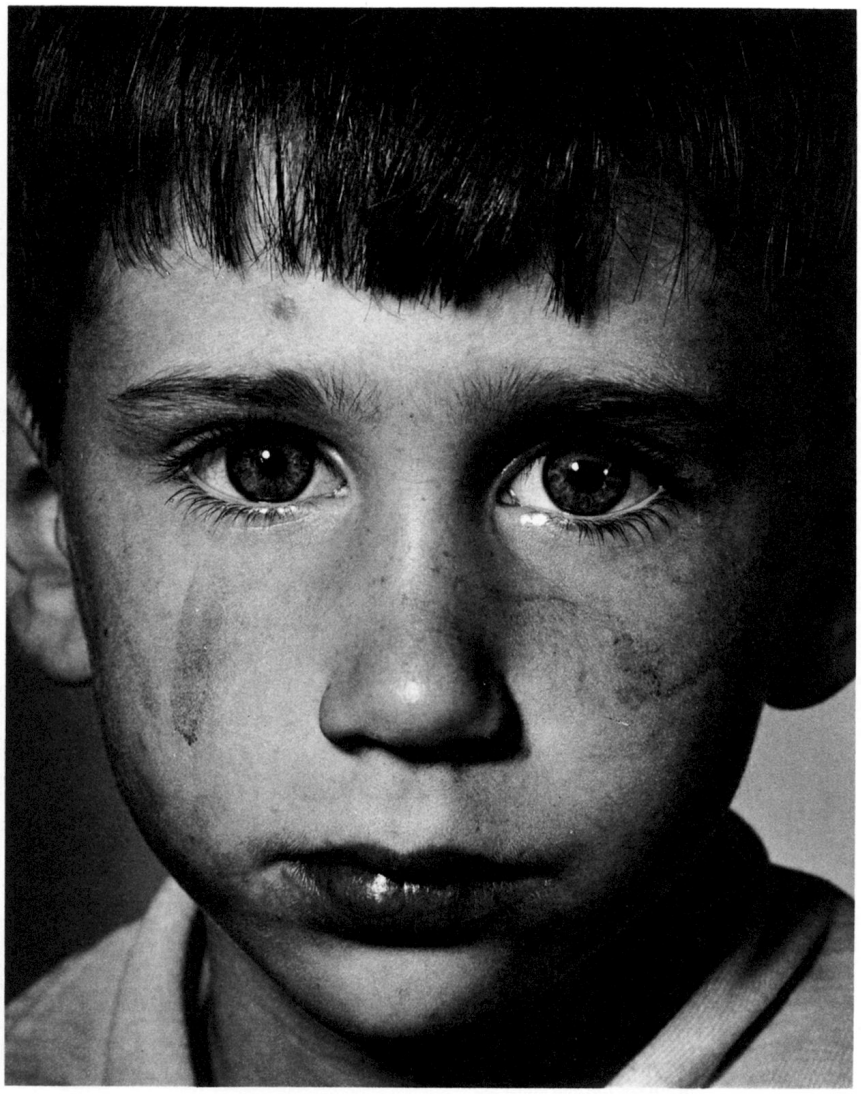
How to choose the right film

The variety of black-and-white films available today is great. All of them can be used to obtain good pictures, but some will give better results than others in certain picture-taking situations.

You should choose a film for your camera that offers a combination of color sensitivity, speed, grain, and contrast that will best serve your purpose. This is not as complicated as it may sound. To help you choose black-and-white films correctly, we have grouped them in three broad "families": films that give you the most *versatility*, films that provide the greatest *speed*, and films that give you the most *sharpness*. Each of these families is discussed in terms of its characteristics and the type of pictures for which it is most appropriate. For a detailed listing of popular 35-mm, roll, and sheet films in each of the three families, see your Technical Manual and make a specific choice of brand from there.

When selecting a film, it makes a great deal of sense to *standardize*. We suggest that you first choose a film from the "greatest versatility" group. Work with this one film for some time until you *thoroughly understand its characteristics and performance*. Shoot pictures with it indoors and out, including a variety of subjects. Once you become familiar with a film, you'll probably find that it's easier to expose it properly. And as you become accustomed to developing your chosen film and making prints and enlargements from it, you should find that your control over the entire photographic process has improved. You should be able to concentrate on seeing and creating pictures with greater freedom than before.

Later on, after you've fully familiarized yourself with one of the "greatest versatility" films, select a film to use for subjects that require greatest possible sharpness, and a film that gives you maximum speed. Again, work with just *one* film from each group and thoroughly acquaint yourself with its performance. With a mastery of these films–one for versatility, one for sharpness, and one for speed–you should be able to choose a film that precisely fits the needs of almost any subject for black-and-white photography.



Films for greatest versatility

Not all your pictures will be made under the same lighting conditions. Sometimes you'll shoot on sunny days, on cloudy days, by flash, electronic flash, or by floodlights. It's useful to have a single film that can give you good results under all these circumstances. A film from the "maximum versatility" group will allow you to handle a variety of shooting situations without the bother of changing from one kind to another.

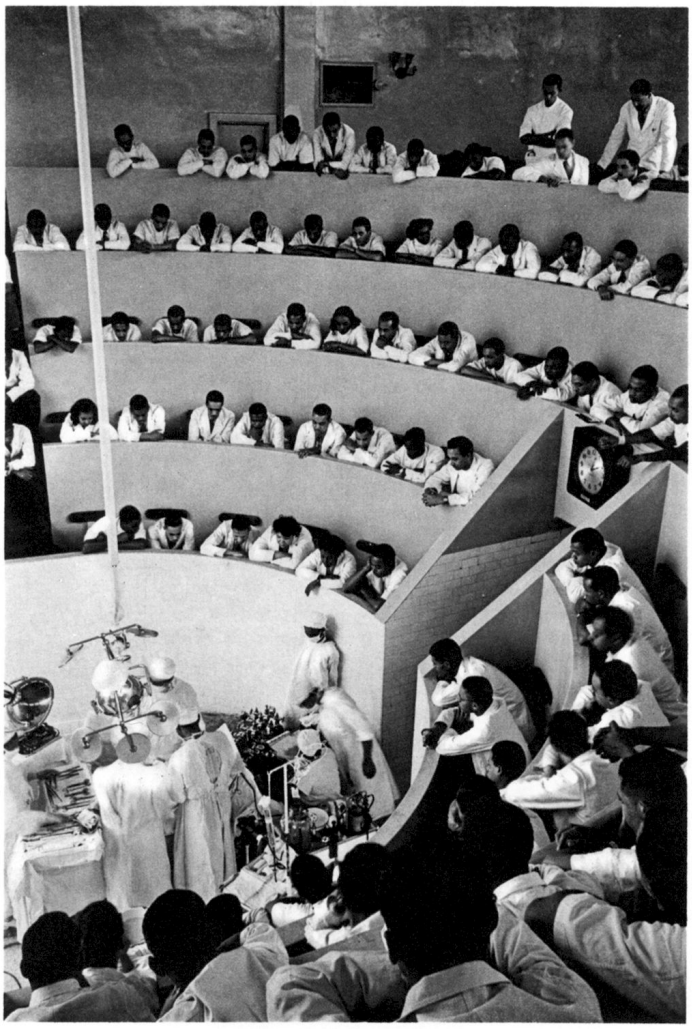
Medium-speed pan films give this versatility. They are slow enough to be used conveniently in strong outdoor light, yet fast enough to give you pictures indoors in fairly bright room light. They offer medium-fine grain and normal contrast. When correctly exposed and processed, today's medium-speed films can give you sharp, high-quality enlargements even from small 35-mm and roll-film negatives. *You'll probably find such films satisfactory for the majority of your black-and-white lesson assignments.*

Many of your Faculty members choose a medium-speed film for much of their work. For example, this expressive close-up portrait of a boy, by Harry Garfield, was taken on a medium-speed film with an exposure index of ASA 160. When used with the electronic-flash lighting equipment in Garfield's studio, the film is fast enough to allow him to expose with a small aperture–*f*/16 in this case–for adequate depth of field even at close shooting distances. At the same time it gives a moderately fine-grain image with normal gradation of tones.

Films for greatest sharpness

A film that will give you greatest possible sharpness and fine detail is useful for some kinds of picture-taking situations. You might choose a film from this group when you want to use a small roll-film or 35-mm camera for portrait work but achieve a picture that is crisp and ultra-sharp, and that looks as if it had been taken on larger film. You might use this film when you're shooting an industrial, architectural, or other subject that contains fine detail–such as these statues, photographed at Notre Dame Cathedral by Arthur d'Arazien–and want to record the detail as clearly as possible. This film is also useful when you want to make an extra-big enlargement that has a sharp image and fine grain.

A *slow-speed, ultra-fine-grain film* is a logical choice for such picture-taking situations. Many of these films have a very thin layer of emulsion, which increases the sharpness with which they can record an image. Also, they have extremely fine grain, and tend to be slightly higher in contrast than most medium-speed and all high-speed film. Because of their relatively slow speed [most of the "thin emulsion" films for maximum sharpness have an ASA exposure index of something between 16 and 64], they are most practical for situations where the light is fairly bright: outdoors during daylight hours or indoors with flash or flood.



Films for greatest speed

When the light is very dim, a medium-speed film can give you problems. It may require such a long exposure that you won't be able to hold your camera steady during the time the shutter is open. Even with a slow shutter speed, you may need to use such a wide aperture that you won't get sufficient depth of field for your purposes. In these dim-light picture-taking situations a high-speed film can be most helpful.

There are various makes of high-speed films, just as there are various medium-speed and slow-speed films. Some high-speed films are considerably faster than others. Therefore, you'll notice that in the Technical Manual we've divided them into two subgroups–the "standard" fast films and the "super-fast" films.

In most cases, a film from the standard-fast-film category will be your wisest choice for shooting in moderately dim light. It will give you the advantage of considerable extra speed at little cost in image quality. Grain, naturally, will be somewhat coarser than you would get with a medium- or slow-speed film, but should be acceptable on normal [8x10 and 11x14] enlargements made even from small roll-film and 35-mm negatives. Sharpness remains good, too.

With the super-fast films, you'll get a marked increase in grain, and sharpness will seem less good. So reserve these super-fast films for the times when you *must* have the added speed or miss your picture.

Fast films in general have lower contrast than do medium-speed films. This can be a slight advantage when shooting pictures in very contrasty light–for example, a living room at night with pools of lamplight surrounded by large dark areas.

For a typical example of a situation where high-speed film is needed, look at Alfred Eisenstaedt's photograph of an operation. He chose to shoot by the light that existed in the amphitheater to make the picture look realistic and candid. However, he also wanted to record everything sharply, from the medical students in the foreground to the far wall. This required that he use a small aperture to provide great depth of field. To fill these needs, Eisenstaedt chose a standard fast film that had an exposure index of ASA 400. It allowed him to expose for 1/10 second at *f*/16–a small enough aperture to obtain the depth of field he wanted. [Courtesy *Life* magazine, ©Time, Inc.]

Filters for black-and-white photography

Filters are helpful accessories for black-and-white photography because they enable you to *control values in a picture*. By choosing the correct filter you can record a selected color or colors darker or lighter than they would otherwise appear. For example, by placing a yellow filter in front of your lens you can darken blue sky and therefore make white clouds stand out more boldly, or by using a green filter you can lighten the green of foliage in your picture. This control over values can help you emphasize or subdue objects, achieve a more accurate rendition of the subject, or improve the picture's composition.

The use of filters in black-and-white photography isn't difficult to master. We'll first discuss the basic principles that apply to all filters, and then indicate the important uses of the more common ones—the medium yellow, the light green, the dark yellow, and the red. On these pages we'll demonstrate the effect of each one of these filters on a subject containing a variety of colors, and then show you how members of your Guiding Faculty have used filters in a creative way, to strengthen and improve their pictures.

How filters work

Filters are transparent colored disks or squares that you mount in front of the camera lens to sift the light passing through on its way to the film. Think of a filter as a kind of screen or sieve that lets light of its own color pass through, but holds back some or most of the light of other colors.

To understand how filters work, it's helpful to think of white light as being composed of *three primary colors—red, blue, and green*. In other words, if you mix red, blue, and green light the result is white light. Remember, we are talking about *light* here—not paints or pigments. The facts you may have learned about mixing paints do not apply to light.

If you mix red and blue light, you get a bluish red called *magenta*.

If you mix blue and green light you get a greenish blue called *cyan*.

If you mix red and green light you get *yellow*.

A filter, we have said, transmits light of its own color. For example, a red filter looks red because it passes red light, but holds back most of the blue and green. A yellow filter looks yellow because it passes red and green light [which, combined, make yellow], and holds back some of the blue light. A green filter looks green because it transmits green light, holding back some of the red and blue.

You can apply this knowledge by remembering two simple rules about filters:

1. *To record a color in a shade of gray that is lighter than normal, use a filter which transmits that color.*

For example, a red filter passes red light, and therefore will lighten red objects in the picture.

2. *To darken a color, use a filter which holds back that color.*

Taking the same example again, the red filter holds back most of the blue and green light. Therefore blue, green, and greenish-blue [cyan] objects will be darkened in the picture.

The strength of a filter—the degree to which it can change values—depends on the intensity of its color. A medium yellow filter, for example, has less effect than a dark yellow filter, which is stronger and more intense in color.

In using a filter, you may need to give additional exposure to make up for the light that the filter holds back. The amount of extra exposure required is given as a number called a *filter factor*. This filter factor depends on the kind of light illuminating the subject [daylight or tungsten], on the color sensitivity of the film [ortho or pan], and on the color and strength of the filter itself.

You'll find filter factors listed on the instruction sheet that comes with the filter, and on the film data sheet supplied by the film manufacturer.

The filter factor tells you *how many times you need to multiply the exposure*. A factor of 2, for example, means you should give twice as much exposure. [Either open up the aperture one full stop or reduce the shutter speed by one half, whichever is more convenient.] A filter factor of 4 indicates a four-time increase in exposure. [Open up *two* stops. Each stop you open up doubles the preceding exposure.]

Overexposure is a great enemy of a filter's effectiveness. If you overexpose, you tend to wipe out the effect the filter is designed to give. In practice, you may find that the filter factors listed by the manufacturer are somewhat too generous for your particular purpose, even though technically correct. If you don't get the degree of value change expected, try reducing the filter factor slightly. For example, some photographers increase exposure for a medium yellow filter by only half a stop instead of the recommended full stop, thus producing a slight degree of underexposure. However, there's no firm rule for this; it's largely a matter of trial and error, using the manufacturer's recommendation as your starting point.

Why you may need a filter

There can be many good reasons for using a filter. These reasons should become clear to you as you study the demonstrations here and on the following pages. First, however, to give you an overall picture of the importance of filters in black-and-white photography, let's list some of the more common reasons.

1 To improve the rendition of the sky: If you've taken pictures of outdoor scenes, you've probably had this experience: When you shot the picture, the sky was blue with white clouds, but when you looked at your resulting black-and-white print the sky was disappointingly bare and pale and the clouds were indistinct.

A filter can correct this. It can add tone to the sky and thus "bring out the clouds." That is, it can make the white clouds more prominent by setting them off against the darkened background. [Of course, no filter can add clouds to the sky if they weren't there in the first place.]

You can darken the sky tones to any extent you desire by the particular filter you choose. For example, a medium yellow or a light green filter adds a moderate amount of tone to the sky for a natural-looking effect. A dark yellow filter renders the sky in tones that look somewhat darker than normal, and a red filter produces skies that are dramatically black, thus strongly emphasizing any clouds.

These filters will have a corresponding effect on water that reflects blue sky. The more intensely blue the water, the more effective the filter.

There's another important point to keep in mind. All the filters mentioned above can improve the rendition of *blue* sky or blue sky containing some white clouds. However, they will have little or no effect on gray, overcast sky.

2 To add contrast: Sometimes you may want to add contrast to a picture—to give it more snap and sparkle. In outdoor scenes on bright sunny days a filter can help you achieve this effect. On fair days, the shadows outdoors contain blue light reflected from the sky. A filter can darken these shadows, and thus add to the contrast in the resulting black-and-white picture. Not only large shadows, but also the tiny shadows which reveal the texture of surfaces, can be intensified. This has the effect of emphasizing textures. A medium yellow or a light green filter tends to increase contrast *slightly*, a dark yellow or a red filter increases it strongly.

3 To separate colors: In a black-and-white picture, different colors may be recorded as having the same value. For example, a light green and a light red might be recorded in the picture by identical shades of gray. An appropriate filter can separate such colors and prevent them from merging. For example, if your subject were a girl in a light red dress standing before a light green background, it might be very desirable to separate the two by using a red filter. Remember, to lighten a particular color, use a filter that passes that color; to darken it, use a filter that holds it back. In this case the red filter would darken the green background and lighten the red dress.

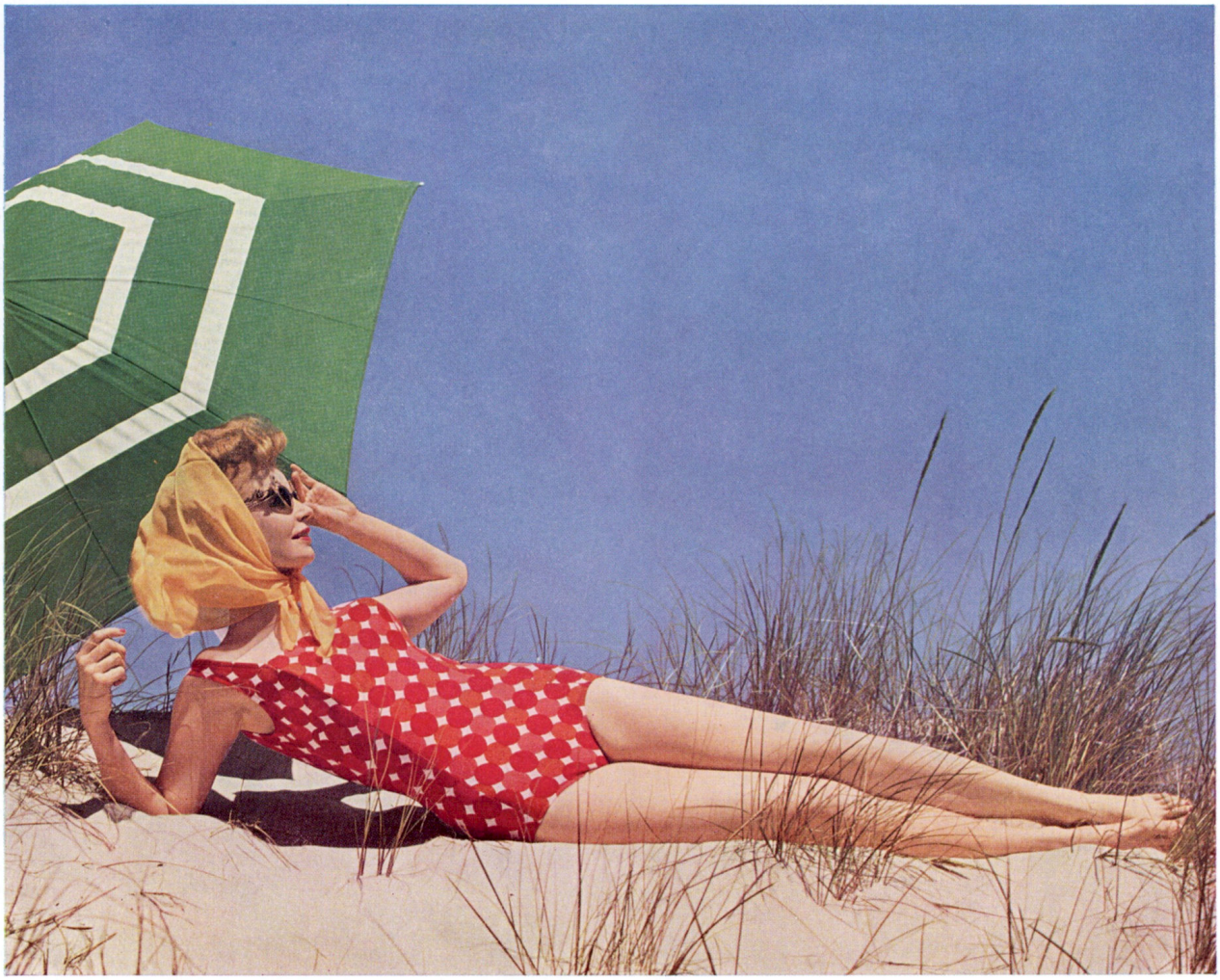
4 To penetrate haze: All the filters we'll talk about here have some ability to penetrate bluish atmospheric haze and thus make distant objects appear sharper. This effect is relatively slight with a medium yellow or light green filter, relatively great with the stronger dark yellow or the red filter. Although all these filters can cut through atmospheric haze to some extent, they *cannot* pierce fog or mist.

Most of the things we see and photograph have color, like the sky, trees, and water in this peaceful autumn landscape. When photographed in black and white, these colors are recorded in white, black, and various shades of gray that *approximately* correspond to the lightness or darkness of the colors as they are seen by our eyes.

Here is the same landscape recorded on panchromatic film without a filter. The dark green of the trees is recorded as dark gray, the blue of the sky and water as lighter shades of gray, and the white clouds as white. Notice, however, that the sky appears paler and the clouds stand out less clearly than in the color shot.

A medium yellow filter was used to make this photograph on the same panchromatic film as before. Notice that the filter has slightly darkened the sky, giving it fuller, more natural-looking tones and making the clouds stand out more distinctly. A light green filter can have a very similar effect.

A dark yellow filter was used for this photograph. Notice that the sky is recorded in tones that are somewhat darker than normal; this makes the clouds stand out boldly and focuses our attention on them. The water is also quite a bit darker. A red filter produces a similar but even more pronounced effect.



Three filters: their effects compared

Numerous filters are available for black-and-white photography–some for general use and others for specialized purposes. Here we'll demonstrate three important ones–the *medium yellow*, *light green*, and *red*–that many photographers find useful for outdoor photography.

The photographs on the facing page show how these filters recorded the same subject–reproduced above in full color–including blue sky, a green umbrella, a red-and-orange bathing suit, a yellow-orange scarf, sand, and flesh tones. This subject was photographed on a pan film in four ways–with no filter, and with each of the three filters listed above. This comparison should give you a clear idea of what these filters do, and how they can help you control the values of your own photographs. [All filter factors are for pan film used in daylight.]

Of the three filters demonstrated, the *medium yellow* probably is the most commonly used because of the natural-looking results it can produce and because of its low filter factor [usually 2–one full stop] on pan film in daylight. However, the *light green* filter also is a good choice for general outdoor shooting. Like the medium yellow, it produces a natural effect and darkens blue sky somewhat. It's a good choice for shooting portraits against a blue sky. A medium yellow filter, used for this kind of picture, may record flesh tones as slightly too pale, especially if the subject is sunburned. A light green filter holds back red light and therefore tends to darken sunburned skin.

The *red* filter is most often used for landscape and architectural photography. It has considerable ability to penetrate haze, to increase contrast, emphasize texture, and to produce dramatically dark skies. It is not suitable for photographing people when you want normal-looking results, because it produces chalky white lips and bleached-looking skin tones.

The *dark yellow* filter [demonstrated in the landscape picture on the preceding page] has a more pronounced effect than does a medium yellow filter, but it is not so strong as the red. Like the red filter, it is used for scenes and architectural subjects, but is not usually employed for pictures of people because of the bleached-looking skin tones it tends to produce. The dark yellow filter usually has a filter factor of 3 or about 1½ stops. Some filter manufacturers offer an *orange* filter. This is very similar in effect to the dark yellow, and usually is employed for similar purposes–to considerably darken blue sky and increase contrast in scenic and architectural pictures.

No filter

A normal exposure of 1/125 second at *f*/16 on panchromatic film gives generally pleasing, natural-looking results. However, the sky is somewhat lighter in value than in the color version.

Medium yellow filter

Because it holds back some blue light, the medium yellow filter has darkened the sky. The red-and-orange bathing suit is slightly lighter than in the no-filter picture. The flesh tones look about normal, but are a trace lighter than without a filter. [This effect is more noticeable in a close-up portrait.] The exposure, including the usual filter factor of 2, was 1/125 second at *f*/11.

Light green filter

The light green filter, like the medium yellow, moderately darkens the blue sky and gives a generally natural-looking rendition of the values in the subject. Remembering the rule that a filter tends to *lighten* objects of its own color, compare the umbrella here with the umbrella in the no-filter picture. The addition of a light green filter slightly lightens the shade of gray with which the umbrella is recorded. The exposure was 1/125 second at *f*/8. [Filter factor usually is 4–two stops.]

Red filter

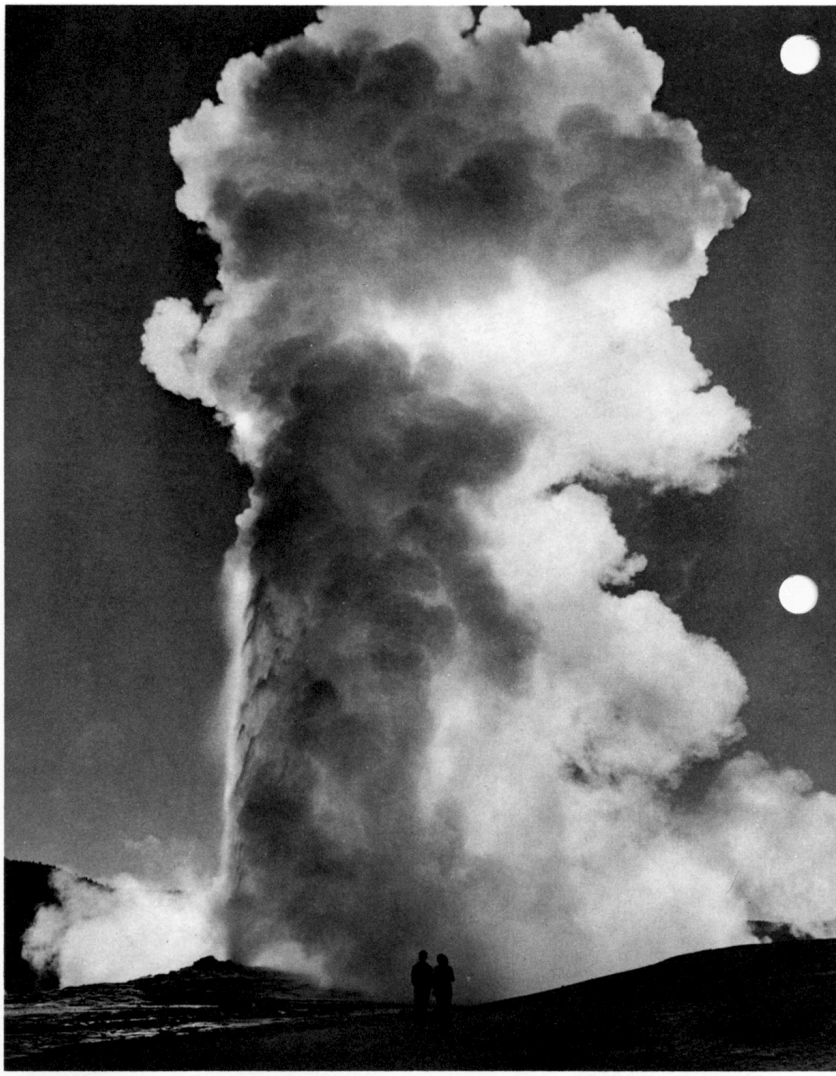
See how the blue sky goes almost black here. Green objects go very dark, too. [Notice that the green umbrella and the blue sky–both recorded in very dark shades of gray–tend to merge in this picture.] On the other hand, the bathing suit is recorded as a very light gray, and the flesh tones are pale. A red filter [like a dark yellow filter] is usually not appropriate for pictures of people, but it can dramatize scenes and buildings with its spectacular sky effects. Exposure was 1/125 second at *f*/5.6. The filter factor usually is 8 [three stops]. A red filter should not be used with ortho film. Because a red filter mainly passes red light, and ortho film is "blind" to red, the result would be practically unexposed film.

Using filters to create effects

The members of your Guiding Faculty often use filters in their black-and-white photography to control values for better composition and a more expressive picture. Of course, like any other photographic device or technique, filters should be used with intelligence and discrimination. First decide what effect you want –what rendition of the values in your subject will help your picture communicate most effectively. Then choose the filter, if any, that best serves this purpose. In each of the accompanying photographs, a filter was used by the photographer to create a specific effect or effects that add to the picture's clarity and impact.

Medium yellow filter

Arthur d'Arazien used a medium yellow filter for this water-skiing picture because he wanted to make the white spray and curving wake stand out against the blue water. Just as blue sky can be darkened by use of a medium yellow filter, so can water which reflects blue sky. White foam and spray will stand out more strongly, thus adding sparkle and contrast to the picture. [There's a side benefit to using a filter when photographing subjects in the water–the filter protects your lens from flying spray or splashing water.]
[Courtesy American Machine and Foundry Co.]

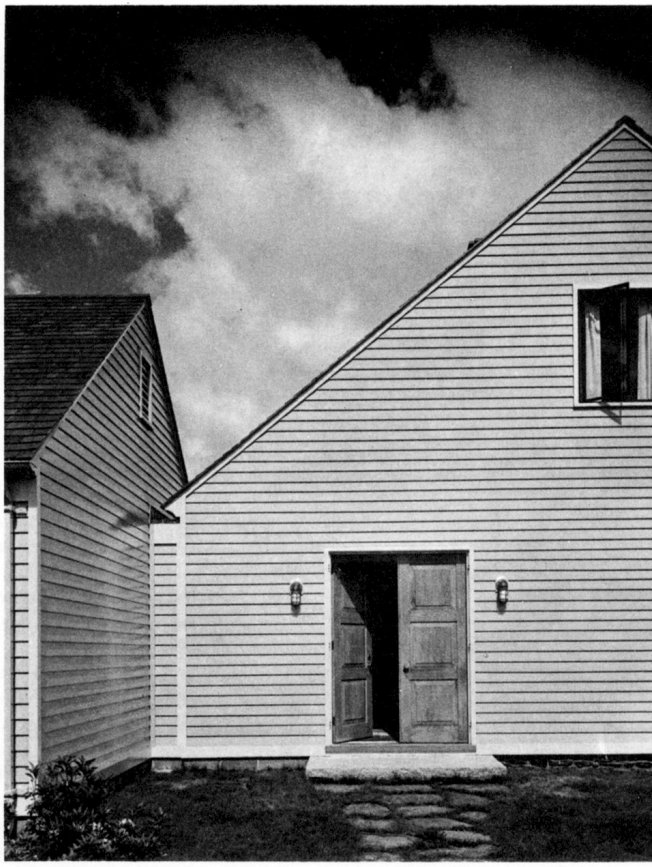


Medium yellow filter

A filter also played an important part in making this photograph effective. To dramatize the size and power of "Old Faithful" geyser in Yellowstone National Park, Eisenstaedt used two figures in the foreground–their tiny size establishing the geyser's towering height. He used a medium yellow filter to darken the clear blue sky, set his exposure for the bright white areas of steam and water, and shot with the light coming from behind the geyser. The combination of a medium yellow filter and the relatively low exposure recorded the sky as darker than normal, making the geyser stand out dramatically–just as white clouds stand out against a dark sky.
[Courtesy *Life* magazine, ©Time, Inc.]

Red filter

New snow covered the trees on Mont Tremblant in Canada's Laurentian Mountains, where Alfred Eisenstaedt was shooting a picture essay for *Life*. He used a red filter to darken the intense blue sky until it went almost black, thus making the white, snow-covered branches stand out boldly. The values aren't "natural," but the increased contrast adds to the emotional impact of the picture—conveys the dazzle and brilliance of a bright winter day after a snowfall.
[Courtesy *Life* magazine, ©Time, Inc.]



Dark yellow filter

Ezra Stoller used a dark yellow filter to photograph this restored New England house because he wanted clean, crisp shadows that would increase contrast and emphasize texture. These intense, clear-cut shadows [darkened by the filter] enhance the geometrical precision of the picture's composition. For example, the horizontal shadow lines of the clapboard are as sharp as if drawn with a pen and ruler, and the dark rectangles of the door and window stand out strongly against the white wall. The dark yellow filter also darkened the sky, which effectively sets off the whiteness of the house. The result is a photograph which expresses the clean, austere elegance of New England architecture.
[Courtesy George W.W. Brewster, Architect]

Exposure in black-and-white photography

Unless the proper amount of light reaches the film during the time you take the picture, you won't get a good negative. And without a good negative it may be difficult or even impossible to make a good print. Therefore, proper exposure is essential to achieving good pictures.

The action of light puts a latent image on film by affecting the light-sensitive particles of silver salts in the emulsion. During development, these are converted into black, metallic silver to form the negative. If you give too little exposure, the negative may be too *thin*–it may not have enough black metallic silver to form the negative image. On the other hand, if too much light falls on the film during exposure, the resulting negative may be overly *dense* and *opaque*. Correct exposure [plus proper development] avoids these two undesirable extremes, and gives you a negative of good quality.

If you *underexpose*, you may lose important details in shadow areas. Details you don't capture on your film when you take the picture can't be added later on.

If you *overexpose*, you may "block-up" highlight areas so that their detail is lost. Also, overexposure tends to increase grain and to reduce the sharpness of a picture.

These are strong enough reasons for you to become proficient in exposing correctly. But exposure is important for *aesthetic* reasons, as well as for reasons of technical quality. For example, the way you expose helps control the value scale of your pictures–whether they favor the light, bright, high-key tones or the dark, shadowy, low-key ones. And the predominance of light or dark values, as you have seen, can produce a powerful emotional effect on the viewer. Exposure also can help you emphasize lighter or darker areas of the picture, to accentuate or play down a certain portion of the scene, to show the subject as a silhouette, or to eliminate unwanted background detail. Thus it's a helpful aid to composition. We'll show you some of these effects later in this lesson.

The key idea in exposure is *control*. You first must learn to achieve correct, normal exposure consistently with a variety of lighting and subjects. Then you'll be able to vary your exposures when you wish, for special effects such as those mentioned above.

The exposure tables provided by film manufacturers are reliable as *approximate* guides to good exposure. But for more precise, refined exposure control you should use a *good-quality exposure meter*. We suggest that you acquire a well-built exposure meter from a reliable manufacturer as early as possible. Properly used, this accessory can speed up your improvement as a photographer, save you wasted film and effort, and make it easier to complete your lesson assignments successfully.

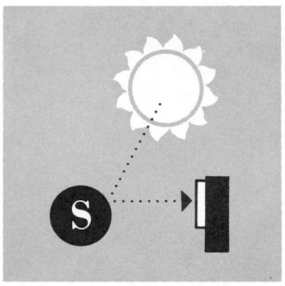
Exposure meters

An exposure meter measures the intensity of light and therefore helps take the guesswork out of exposures. The most reliable and accurate kind of exposure meter–the kind used by most professional photographers–employs a light-sensitive cell to measure the light. When the meter is in use, light falling on this cell results in movement of a needle on the meter dial. The stronger the light, the farther the needle travels. This is the kind of exposure meter we'll discuss and demonstrate on the following pages.

With most of these exposure meters, you first set the dial for the exposure index of the film you are using, then aim the cell and take your reading. The dial is marked so that you can quickly and simply convert this reading into the different combinations of shutter speed and lens opening that will give you correct exposure. You choose the most advantageous combination, and set your camera controls accordingly.

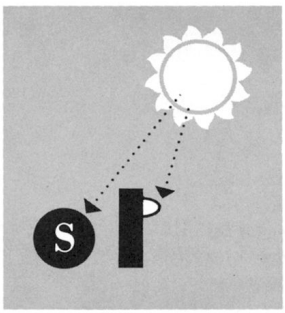
The details of using a meter differ with different makes and models. These details are thoroughly covered in the instruction booklet that comes with your meter. As with your camera instruction booklet and film data sheets–read the instructions carefully. This is most important: it can save you a great deal of needless disappointment, confusion, and wasted film.

Exposure meters with light-sensitive cells are made in two basic types: the *reflected-light* and the *incident-light* type.



A reflected-light meter measures light reflected from the subject.

The reflected-light type is the more common of the two. As the name indicates, it measures the brightness of the light reflected from the subject. If you move close and measure the light reflected from a bright area only [say a person's face], you'll get a relatively high reading. If you measure a dark area only [say a black shadow], you'll get a relatively low reading. If both light and dark objects are included within the area covered by the light-sensitive cell, the meter will give you an overall average brightness reading of the light reflected from the various objects.



An incident-light meter measures light falling on the subject.

An incident-light meter, however, works on a different principle. It measures the brightness of the light falling *on* the subject. A typical incident-light meter has a translucent, white plastic, light-gathering hemisphere over the cell. You hold the meter close to the subject and point the cell toward the camera position, or where you know the camera position will be. Thus the light falling on the hemisphere is the same as the light falling on the part of your subject that faces the camera.

The incident-light type of meter ignores the light or dark values in the subject itself. It is designed to give you correct exposure for a subject of average brightness or a scene containing a normal range of tones from light to dark. You may vary the exposure setting you actually use, depending on the subject. [Many reflected-light meters include an attachment that converts them to incident-light use.]

Both types of exposure meter–properly used–can give you precise, reliable results. We show you the correct uses of reflected- and incident-light types on the following pages.

How to hold an exposure meter

A good exposure meter of the incident- or reflected-light type is a precision instrument. However, to make good use of it you must know how to hold and handle it properly. The examples given here will help you do this—and avoid the most common errors that beginners often make. *These directions are important!* Unless you learn to hold your meter correctly you may get misleading readings.

Reflected-light meter

Right: Close-up readings are the most accurate. Hold your meter like this—six or eight inches away from the part of the subject you are measuring [in this case the sunlit area of the girl's face]. Hold the meter as indicated by your instruction manual and be sure your hand or fingers don't block the light-sensitive cell.

Wrong: Don't take a reading from too far away, like this. The meter's cell is picking up light from the girl's hair and the sky behind her as well as from her face. This will throw off the accuracy of your measurement.

Wrong: Here's another common fault in using a reflected-light meter. The photographer's hand and meter are throwing a shadow on the girl's face. The meter is measuring this shadow as well as sunlit skin tones, and will give a misleading reading.

Incident-light meter

Right: Hold the meter close to the subject and aim the cell [with its light-collecting hemisphere] toward the camera position. Make sure the light falling on the cell is the same as that falling on the part of the subject that faces the camera.

Wrong: Here the photographer's own shadow falls on the meter. The meter will indicate an exposure that is too much for the sunlit subject.

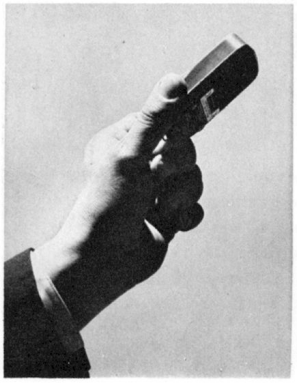
Wrong: Here the cell's light-collecting hemisphere is *not pointed toward the camera position, but toward the subject.* With an incident-light meter you must measure the illumination falling on the part of the subject that faces the camera.

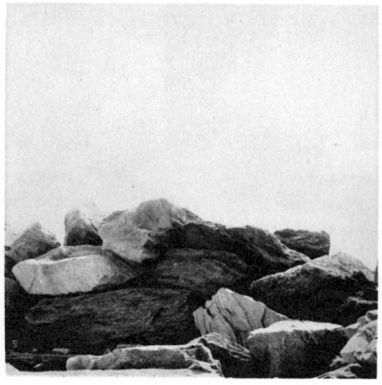
Reflected-light meter: how to take an overall outdoor reading

The most reliable measurements with a reflected-light meter usually are those made close up. However, when photographing an outdoor scene, it may be best to use your reflected-light meter for an overall reading of the scene as a whole. The illustrations on this page show the right and wrong ways to hold a reflected-light meter for such overall measurement, and the photograph obtained each time.

Meter pointed too high

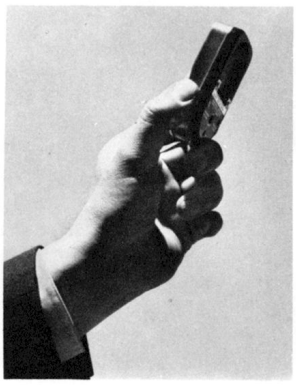
If you point the cell upward like this, the meter will be overly influenced by bright light from the sky, and you'll get too high a reading for the scene as a whole. The sky will be correctly exposed, but any dark foreground objects—like the rocks in the picture at the right—will be underexposed. They'll be recorded too dark and lacking in detail.





Meter pointed too low

Whenever you point the cell too far down like this, you'll obtain a reading that is correct for foreground areas, but may overexpose the brighter parts of the scene—especially the sky. In this case, the meter was strongly influenced by the dark rocks and the photographer gave too much exposure for the scene as a whole. Notice that the bright sky has gone completely blank, losing all the interesting cloud formation seen in the picture at the upper right.



Meter pointed correctly

This is about the right angle to obtain a good average reading for many outdoor scenes. The *slight* downward angle often prevents the very bright light from the sky from throwing the reading off—but the angle is not so great that a dark foreground, such as the rocks here, will dominate the reading. The result is a good compromise exposure, giving an acceptable amount of detail both in the sky and the rocks.

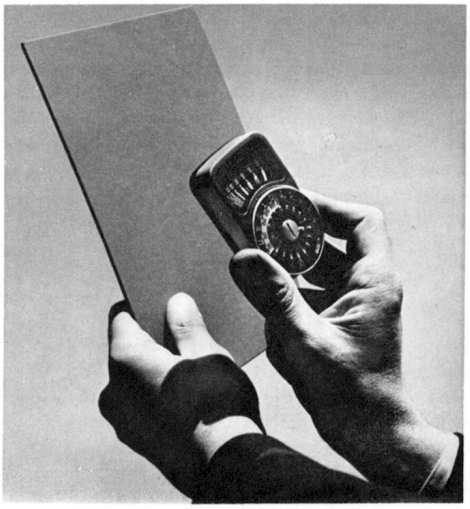
Incident-light meter: how to take an overall outdoor reading

For an overall reading with an incident-light meter, the important thing is to make sure that the light falling on the meter is similar to the light falling on the scene as a whole. In other words, don't take a reading while you're standing in the shadow of a tree or a passing cloud and the scene itself is in bright sunlight, or vice versa.

Also, remember that your incident-light meter gives correct exposure for an *average* scene or subject. If the particular scene you are photographing contains a number of very dark objects that are important, you may need to increase exposure. If the scene contains very light objects that are important, you may need to decrease exposure. Refer to your exposure-meter instruction booklet to find out how much exposure correction the manufacturer recommends for your particular meter when photographing subjects that are considerably lighter or darker than average.

Reflected-light meter: substitute readings

Sometimes you can't get near enough to your subject to make an accurate, close-up reading. Or it's impractical to move close because you don't want to disturb the subject. In this case, use a *substitute* reading. With a reflected-light meter, you often can make a close-up measurement from a *nearby* object that is similar in brightness to your subject [and illuminated by a similar light, of course]. For instance, if you are photographing foliage that you can't get close to because of some natural obstruction, take a reading from similar nearby leaves and base your exposure on this reading. Two other good ways to take a substitute reading are demonstrated below.



Use a gray card

This is a small card of a standard shade of gray that reflects 18 percent of the light falling upon it. [Gray cards like this can be obtained from your photographic dealer.] Take a close-up reading from this card, making sure the meter isn't reading its own shadow. The indicated exposure should be approximately correct for average scenes and subjects containing a normal range of light and dark tones.

The gray card can be used outdoors or indoors, and is useful when you're photographing objects too small to give you an accurate reflected-light reading—such as flowers outdoors or small objects in the studio.

Use your hand

Reading the light reflected off your hand is a useful method of taking a substitute reading. However, be sure your hand is illuminated by light that comes from the same direction and has the same intensity as that falling on the subject.

Your hand, being light, will give you a relatively high reflected-light reading, of course. This will be fairly accurate for scenes or subjects that are predominantly *light*, with no important dark areas or only small shadows.

For *average* scenes or subjects, give the equivalent of a *full stop more exposure* than the meter reading from your hand calls for. *Dark* scenes and subjects will call for correspondingly greater exposure.

Remember: your meter can't think

An exposure meter is a precise and reliable instrument. In proper working condition, it will accurately measure the light that falls on its cell. But it can't do the thinking for you. It can only measure what you choose to measure. You must decide what is the most important detail or details in your picture.

With a reflected-light meter, get close to the subject to take your reading, if this is practicable. Be sure you are measuring only what you want to measure, and that light from other objects or areas isn't making the reading inaccurate for your purpose. With an incident-light meter, make sure that the light you are measuring is identical with the light falling on the subject.

In photographing people, the flesh tones usually are the most important thing to consider, but some shadow areas and dark hair may be important, too. When using a reflected-light meter to take a reading of a person, measure the light reflected from the person's face [or use your own hand if this is more practical] and open up one stop. With an incident-light meter, you generally can use the reading you get "as is" if your subject is a person.

Learn to use your exposure meter to *control* your exposures. Your ability to use an exposure meter will increase with practice and experience. It's a good idea to keep a record of the exposure each time you make a picture. Later, you can go over the prints carefully and see where, if anywhere, you misread the meter or miscalculated the result. Do this for a few rolls and you should quickly improve your proficiency.

Exposure control in contrasty light

Sometimes you'll want to photograph a subject on a bright sunny day, when the light is very contrasty–that is, when there are strong highlights and dark shadows. Common examples of the problems you'll encounter with this type of illumination are a face or an object that's partly brightly lighted and partly in shadow, or a person in the shade with a sunlit background behind him. Still another example is a *backlighted* portrait–with the light coming from behind the subject, throwing the face in shadow. To get the results you want in situations like these calls for careful use of your exposure meter.

With a reflected-light meter, the basic method in these situations is to take *two* exposure-meter readings–one for the most important bright area where you want detail and one for the most important shadow area where you want detail. [With an incident-light meter, the method may vary, as we explain elsewhere on these pages.]

If the difference between the two readings is about six stops or less, you generally can use a *compromise exposure*–an exposure midway between the two extremes–and get a usable amount of detail both in the bright and the dark areas.

For example, if your reading for the bright area indicates an exposure of 1/125 second at *f*/22 and your reading for the dark area indicates that an exposure of 1/125 second at *f*/4 is needed, then the difference between the two is five stops. The midpoint setting is 1/125 second between *f*/8 and *f*/11. At this setting the highlights will be somewhat overexposed and the shadows somewhat underexposed. But the exposure latitude of most black-and-white films will take care of this and give you usable details in both.

If the spread between the bright-area reading and the dark-area reading is greater than about six stops, it's generally best to choose an exposure that favors the lighter areas more, letting the darks go somewhat underexposed, or vice versa–depending on where it is more desirable to show detail.

Of course, this rule about a six-stop difference is an approximate guide only. How well a compromise exposure will work depends to some extent on your subject and the effect you want. While a degree of underexposure in the shadows and overexposure in the highlights may not be objectionable in a landscape picture, it may be less acceptable in a close-up portrait where four stops may be the maximum spread that yields pleasing results. [If the lighting contrast is too great there are things you can do to reduce it. We'll go into this subject in later lessons.]

The accompanying illustrations demonstrate how compromise exposure works out in practice, and how you can control exposure in contrasty light to achieve different effects.

Backlighted subject

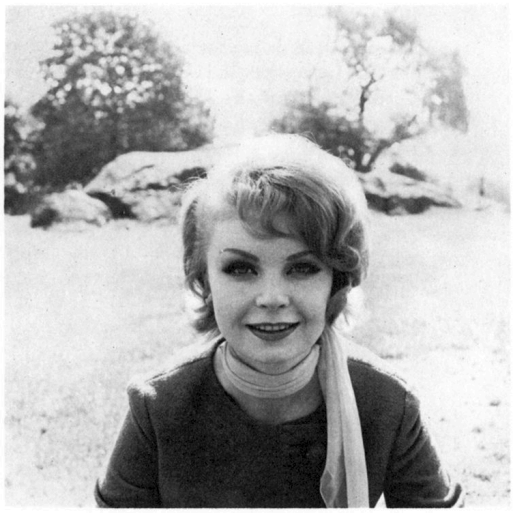
In this demonstration, we take up one type of high lighting contrast–a backlighted subject. The bright sun is high and behind the girl, throwing her face in shadow. Several different approaches are possible in this situation: [1] You can expose for the shadowed face, letting the background go overexposed. [2] You can deliberately underexpose the face to achieve a silhouette or semisilhouette. [3] You can use a compromise exposure. If the contrast is not too high, this may give you good detail both in the face and the brightly lighted areas.

Here we explain how to make a picture by following each of these approaches. The smaller illustrations show in detail how to use a reflected-light and an incident-light meter for exposure control and the larger illustrations show the results you are likely to obtain.

1 Reading the shadows

Incident-light meter: The photographer is using an incident-light meter to measure the light falling into the shadow of the girl's face. Notice he's holding the meter close to the face, with the cell pointing toward the camera.

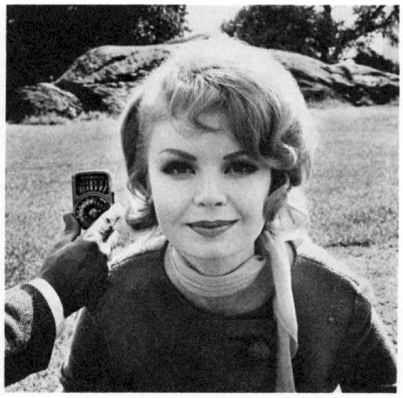
Reflected-light meter: Here the photographer is measuring the same shadow. He's holding the meter close to and directly in front of the face, *being very careful not to let bright light from behind spill into the meter cell.*



Exposure based on a shadow reading: The shadowed face is correctly exposed. Notice that the lighting is soft, pleasing, and natural, that the girl isn't squinting, because the bright sun is behind her, rather than shining into her eyes. However, the grass, portions of the rock, and the sky [as well as the highlights on her hair] are overexposed; these details are pale and washed out. This is not necessarily objectionable in a portrait of this type, where interest is focused on the face itself. In fact, this may be exactly the effect you want if there are details in the background you wish to subdue.

2 Reading the bright backlighting

Incident-light meter: Here the photographer is using his incident-light meter to measure the bright backlighting. He's pointing the meter's light-collecting cell toward the background rather than toward the camera. [If the cell were turned toward the camera, it would be in shadow and thus not give a reading for the backlighting.] The cell should be fully illuminated.



Reflected-light meter: The photographer is taking a reading of the bright background, being careful to hold the reflected-light meter away from the girl so that her shadow doesn't fall on it.

Exposure based on the bright backlighting: Here the grass and bright areas of the rocks are correctly exposed, but the shadows and the girl's face have gone so dark that most of the detail is lost. Sometimes the most effective way to record a subject will be as a silhouette or semisilhouette. However, your subject should have an interesting, easily recognizable shape. For example, in this situation a silhouette might work well if the girl were seen in profile instead of full face.

3 Using a compromise exposure

Here's the result of a midpoint compromise exposure. In this case, the difference between the shadow and the bright background reading was four stops and therefore a compromise was possible. The photographer chose an exposure exactly at midpoint to produce this photograph. The girl's face is recorded in full detail with approximately normal flesh tones, and the bright parts of the background—although somewhat overexposed—are not blank and washed out. The use of a compromise exposure gives us a natural-looking picture with both shadow and highlight detail.

Reading a sidelighted subject

Here we show another type of high lighting contrast—a sidelighted subject partly in sun and partly in shadow. A compromise exposure, as used in this portrait, may give you good detail in both areas if the contrast is not too great.

With a reflected-light meter, take an accurate close-up reading from the highlight side and the shadow side, and select a compromise exposure between these two extremes.

With an incident-light meter, you may be able to place the meter at the middle of the face so the cell receives an equal amount of the light falling on the highlight side of the face and on the shadow side. This gives you a compromise reading at once.

An alternate incident-light method: Take a reading with the meter close to the shadow side so that it receives light falling on this area only. Then take another reading with the meter held close to the highlight side and the cell *pointing toward the light*. Select a compromise exposure.

Tips on using a built-in meter

Use a meter built into your camera just as you would a separate exposure meter. Whenever possible, move in close to your subject and take an accurate short-range reading, as the photographer is doing here.

So far we've talked about the various methods of using accessory exposure meters—meters that are entirely separate from the camera. However, many cameras include a reflected-light meter that is built into the camera body. There are three kinds in general use.

Uncoupled: An uncoupled built-in meter is *not* connected to the exposure controls. You use it to make a reading just as you would an accessory reflected-light meter, then set the exposure controls by hand.

Coupled, semiautomatic: This is a built-in meter that is connected with the camera's aperture or shutter-speed control [sometimes both]. It provides semiautomatic exposure selection. Only three simple steps are necessary: [1] you set a dial to the exposure index of the film you are using; [2] you set one exposure control [usually the shutter speed]; and [3] you point the camera at the subject and line up the meter needle with a marker by adjusting the other exposure control. When the needle and the marker line up, you are set to the exposure they indicate.

Fully automatic: This type of built-in meter gives completely automatic exposure control. In some cases, all you need to do [once the meter is set for the speed of film being used] is point the camera at your subject. The meter automatically sets the aperture and/or shutter speed. In other cameras you can pick the shutter speed you want, and the camera then automatically changes the aperture as the light changes.

Use a built-in meter just as you would a separate meter. Except for long shots of scenes, don't generally rely on long-range readings from shooting position. If practical, first move in close to the subject and take an accurate, short-range reading. If you can't get close, take a reading from your hand, a gray card, or a substitute object. In overall exposures for outdoor scenes, be careful that neither the sky nor large, dark foreground objects unduly influence the reading. This is simple enough to do with an uncoupled meter, and also is practical with

Light backgrounds can mislead your meter

When you take a reflected-light reading from camera shooting position as the photographer is doing here [with a built-in meter on his camera] you may get an exposure that's wrong for the subject. The meter can be overly influenced by light or dark areas in the background.

Here's the result the photographer got. The meter picked up light from the bright sky background as well as light reflected from the girl's face. The reading was too high for the subject and the girl is considerably underexposed.

coupled, semiautomatic types. You can move in to make a close-up reading, set your exposure by aligning the needle with marker, and then step back to shoot from any distance you please.

Many, but not all, fully automatic cameras provide some sort of a "hold" mechanism that allows you to take a close-up reading and maintain this exposure setting as you move back to shooting position. Without such a "hold" mechanism, of course, the exposure may automatically change as you take a picture from the shooting position. Therefore, if you intend to purchase a camera with automatic exposure control, we recommend that you obtain one with a "hold" device.

Built-in versus separate meters

A built-in meter offers an obvious convenience: meter and camera form one compact unit. There's no danger of forgetting to bring your meter along, nor is it an extra piece of equipment to carry. When coupled to the camera's exposure controls [either for semiautomatic or fully automatic exposure selection], a built-in meter helps you get well-exposed pictures with a minimum of thought and effort. In situations where light is continually changing [such as when the sun goes in and out between clouds] or where you need to shoot so quickly you don't have time to stop for an exposure reading, a fully automatic meter system can be very helpful.

However, there are good reasons for using a separate, accessory meter. It sometimes is more convenient to use in making close-up readings. [For example, you may want to leave your camera set on a tripod while you check the light and dark areas of your subject.] With a built-in meter, the temptation to rely on a reading made from camera position is very great, and this can lead to error, as shown below. [Of course, you can make the same mistake with a separate meter, too.]

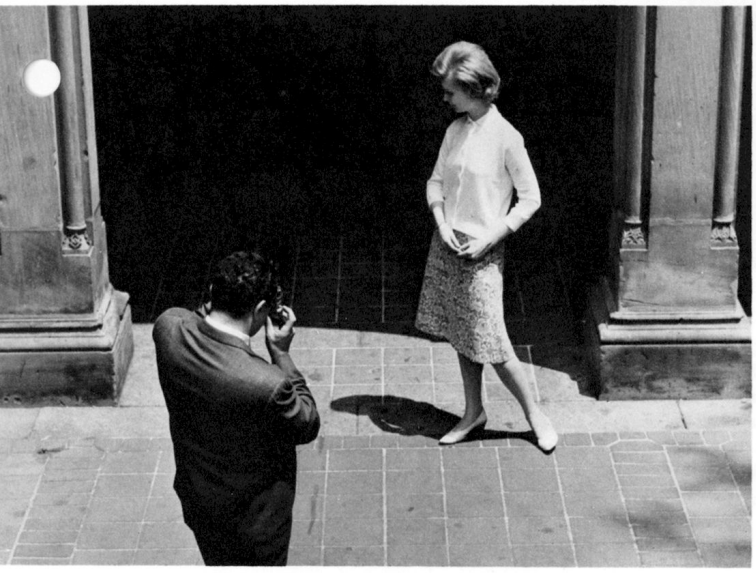
Because a separate meter doesn't need to be as compact as one built into the camera, it may have a larger, more accurate, and easier-to-read dial [and in some cases, greater sensitivity to dim light]. Also, if your meter needs repair or readjustment, you can send it to the manufacturer without being temporarily deprived of your camera in the process.

What price automation?

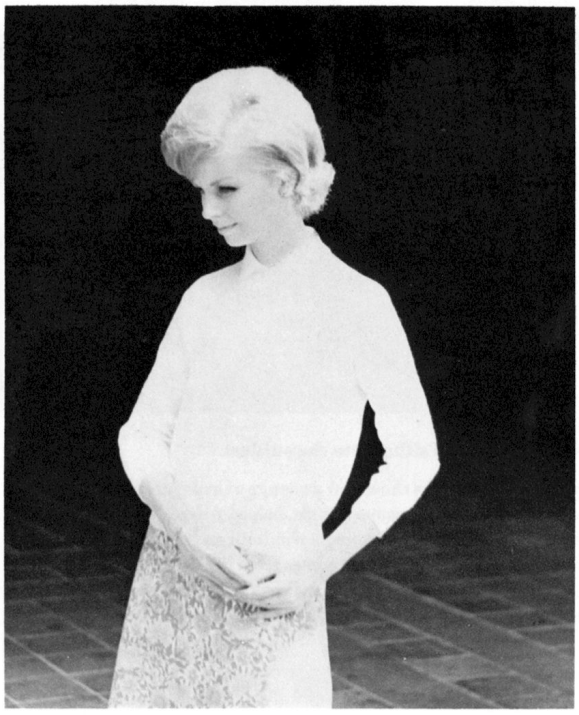
Fully automatic exposure systems have been greatly improved and they can give you accurate results under a number of lighting conditions. However, they have limitations. Choice of shutter speed to blur or stop motion, and choice of aperture to increase or decrease the range of sharpness, are two vital creative controls–but the degree to which you can use them varies in fully automatic cameras. In some cases, with simpler automatic equipment, you may have no freedom. With more advanced types, you may have considerable freedom, plus the choice of switching off the automatic system and setting the controls by hand. Therefore, if you buy a camera with automatic exposure control, be sure it offers you selective automation [such as the opportunity to set the shutter speed you want] and full manual control with clearly visible shutter-speed and aperture settings.

These are some of the advantages and disadvantages of separate and built-in meters–and automatic versus manual exposure control. The members of your Guiding Faculty [and most professionals] prefer to use a separate exposure meter for much of their work–especially studio photography. For the purposes of this Course we think you'll find using a separate meter generally more helpful. However, if you are now using a camera with a built-in meter, this will serve you well, too, if you handle it the way we have shown you. And you can add a separate meter later on for those situations where it serves best.

Dark backgrounds also can mislead



In this situation, the photographer again used a built-in meter from camera shooting position, but here he had a light subject against a dark background. The meter was affected by black shadows surrounding the girl and gave too low a reading.



As a result, the brightly lighted girl is overexposed. Details in her face and sweater are lost. Both this error and the one previously demonstrated could easily have been prevented if the photographer had taken an accurate close-up reading of his subject.

Exposure used creatively

Your first goal in learning to measure or estimate exposure is to achieve a negative of as good quality as possible. That is, it should be neither too dense nor too thin. It should contain a normal amount of contrast and have detail both in the important dark areas and the important light areas. Such a negative will readily produce a black-and-white print of good technical quality.

However, exposure can be a creative control, too. In expressing yourself with pictures, in translating what you see and feel about a subject into a black-and-white photograph, you sometimes may deliberately underexpose or overexpose to produce an effect. For example, you might vary exposure to emphasize the mood of your picture, to show the subject as a silhouette, to "wash out" a light background, or to record a dark background as a solid black. You should learn to use exposure to the fullest creative extent possible.

The pictures on this and the following pages show how members of your Faculty have used exposure in a creative way. In each example, exposure was changed from the normal "correct" setting to create a stronger, more interesting, or more eloquent picture.

Underexposure to silhouette the subject

These two photographs show how a change of exposure, combined with a change of lighting and camera angle, helped Alfred Eisenstaedt make a dramatic picture of boys climbing a windmill on Nantucket.

In the picture at left, the light comes from the right, and an exposure of 1/125 second at *f*/16 gives a normal rendition of grass and houses. The sky is pale and uninteresting, and the choppy light on the boys does not clearly define their figures from this angle.

In the picture at right, Eisenstaedt moved to the left and shot *into* the light, this time reducing his exposure to 1/250 second at *f*/22. As a result the sky goes darker, making the brightly lighted clouds stand out strongly, and the boys are recorded as black silhouettes sharply defined against the sky. The picture is bolder, more visually exciting. [Courtesy *Life* magazine, ©Time, Inc.]

Underexposure for mood

Alfred Eisenstaedt deliberately underexposed here to produce a low-key effect that emphasizes the blacks and dark grays in a somber winter seascape in New England. A "correct" exposure of 1/125 second at *f*/8 would have recorded the dark strip of beach as a lighter tone of gray, and shown details of sand and grass more clearly. The clouds would have been lighter in tone, too, and the two hunters would not have been recorded in total silhouette. But Eisenstaedt wanted to convey a feeling of bleak and wintry magnificence, and therefore reduced his exposure two stops to 1/125 second at *f*/16 on medium-speed film. Of course, a desired high- or low-key effect can be strengthened in printing, too.
[Courtesy *Life* magazine, ©Time, Inc.]

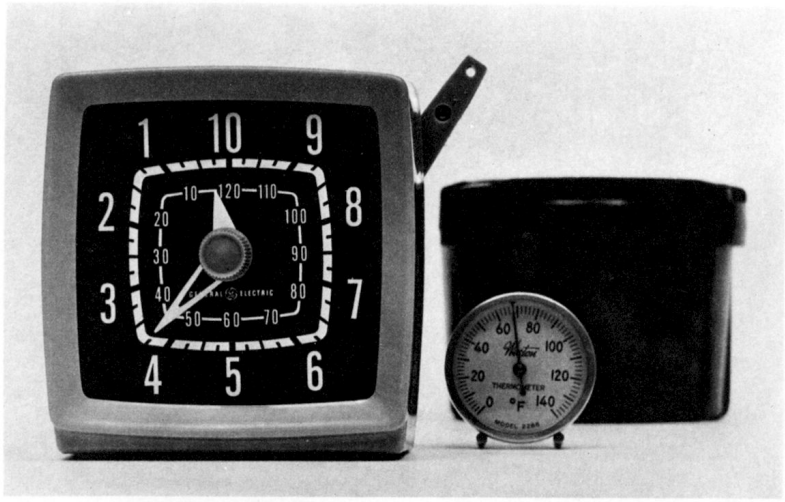
Exposure used creatively [*continued*]

Overexposure to wash out the background

Another use of exposure is to control backgrounds. Bert Stern photographed these two fashion models against a white paper backdrop in his studio, bouncing light from electronic flash units off the paper. He exposed to give a normal rendition of the skin tones on the shadow side of the models–the side facing his camera. An electronic flash exposure with the lens at *f*/11 on high-speed film completely overexposed the background. Dense black on the negative, this area came out pure white in the print. The figures are silhouetted, floating in space and light. In high-style fashion photography such unrealistic effects often are appropriate.

Underexposure for a black background

This example is just the reverse of the one above–here Philippe Halsman deliberately underexposed a dark background to make it turn out totally black in the picture. One floodlight, high and to the left, falls on the face of actress Siobhan McKenna, and a spotlight on her hair highlights it. The effect is of a disembodied face suspended in blackness. The lighting suggests the stage, and emphasizes the dramatic intensity of the upturned face and its expression. Halsman exposed for 1/10 second at *f*/5.6, basing the exposure on a highlight reading only.



With time-and-temperature processing, you develop your film in a lightproof tank by ordinary room light. A timer and a thermometer enable you to control the process accurately.

Developing black-and-white film

Developing is the chemical process that converts the film's invisible latent image into a permanent visible one in the form of a negative. It carries your picture an important step forward toward the reality of a finished black-and-white print.

Developing black-and-white film is not difficult once you have learned the step-by-step routine we shall demonstrate. It takes less skill than many familiar tasks you already know how to perform. The secret of success lies in paying careful attention to details. Acquire good habits right from the beginning and you should quickly be able to master the essentials of developing.

Although developing isn't hard, still it's no mere mechanical chore. It deserves your best efforts because it is an essential link in the photographic process. You can take real pride in producing clean, properly developed negatives. Your final reward, of course, will come when you make black-and-white prints, which we discuss in your next lesson. If you begin with a negative of inferior quality, you'll have to struggle to achieve an acceptable print. But if you begin with a negative that has been correctly exposed and developed, half the battle is won, and you will find your printing much easier and more rewarding.

How developing works

In developing, you use a combination of chemicals called a *developer*. The developer is dissolved in water to make a solution in which the exposed film is immersed. The developer solution—also called a *developing bath*—works selectively on the film's emulsion. It converts the particles of silver salts *that have been affected by light* into black, metallic silver.

After most of these exposed, developable light-sensitive particles have been converted into metallic silver, the result should be a usable negative. At this point, a *stop bath* is used to halt the action of the developer. However, the remaining unexposed and undeveloped particles of silver still are light sensitive. Therefore, you next immerse the film in a *fixing bath* [commonly called "hypo"], which dissolves out these remaining light-sensitive particles. Once these have been removed, only the black, metallic silver remains. Now you can look at the negative in bright light. Finally you *wash* the film to remove any chemicals, dip it in a *wetting agent* [which promotes quick, even drying], and then hang it up to *dry*.

There are two principal methods of controlling the developing process. The method we'll show you here is the simplest form for a beginner to learn and requires no darkroom. It's called developing by *time and temperature*. You load your film into a special *daylight developing tank*, as we'll explain on the following pages. This is the only step that must be done in the dark. Once the tank is loaded and its lightproof lid is on, you can do all the rest of the processing in normal room light.

With the time-and-temperature method, the developing solution is used for a specific time at a specific temperature, according to the developer manufacturer's directions. [A temperature of 68 or 70 degrees F. often is recommended for a majority of the solutions used for processing black-and-white film. Times may vary from as short as three minutes to six, eight, ten, or even considerably more, depending on the particular film and developer combination used, and the results desired.] Although you can't see what's taking place inside the tank, you can control the results with a timer and thermometer.

A second method is to *develop by inspection*. This must be done in a lightproof darkroom. From time to time you actually examine the film by a very dim safelight to see how it's coming along. There are certain advantages to inspection developing because it offers more *direct control* over results than does the time-and-temperature method. We'll show you how to develop by inspection in a more advanced lesson. But, for now, we recommend time-and-temperature processing because it's easy to learn and can be done in your kitchen or bathroom with a minimum of equipment.

On the following pages we list and describe all the equipment and materials you need for time-and-temperature developing of roll film and 35-mm film, and tell you how to set up for a developing session. Then we demonstrate the proper procedure in step-by-step detail. Finally, we show you some of the most common mistakes that can happen during developing, and how to prevent them.

Here's what you need to develop roll and 35-mm film

The equipment and materials you need for developing film can be obtained at most photo dealers.

1 Four 1-quart, wide-mouthed, brown glass bottles [with caps] for your solutions: developer, stop bath, fixing bath, and wetting agent. Bottles should be clearly labeled. We recommend four bottles, although more may be useful. However, you can get by with as few as two if you mix fresh stop bath and wetting agent for each session.

2 An accurate darkroom timer with an alarm. Purchase a model with a large easy-to-read dial.

3 A one-quart mixing graduate marked in liquid ounces–the white enamel hospital type shown here is good.

4 Two soft, fine-textured, cellulose photographic sponges to remove excess moisture from the washed film.

5 Daylight developing tank. This is a lightproof metal or plastic container. It includes a cylindrical body to hold the processing solutions, a reel on which you wind your film, and a removable lightproof top with openings for pouring in or emptying out the solutions. We suggest you use an adjustable model that holds film of various sizes [usually 35-mm to 120 roll film].

6 A pair of film clips for hanging your developed film up to dry.

7 A glass or plastic stirring rod. [Also called a mixing rod.]

8 A good-quality darkroom thermometer of the dip-in type, like the one shown above. We recommend that you don't skimp on this item. A reliable, accurate thermometer is essential to control the developing process.

9 A small glass or plastic funnel for pouring solutions without spilling.

You'll need the following chemicals:

Developer: You can buy the chemical ingredients and make your own developer according to a number of formulas. However, many photographers find it more convenient to use one of the numerous packaged developers on the market. Some of these come in powdered and some in liquid form. There are dozens of excellent makes–some for all-around use and some for specialized purposes. [For a detailed listing, see your Technical Manual.] The important thing, at this stage of the Course, is that you select a good all-purpose developer and stay with it until you learn its characteristics thoroughly.

Stop bath: You can buy packaged stop bath. However, it's less expensive and equally effective to make your own. Buy a bottle of 28 percent acetic acid and add 1 1/2 ounces to one quart of water to make the working solution.

Fixing bath: Ordinary fixing baths have a characteristic acid smell and are commonly called "hypo." They fix a roll of film in about ten minutes. You may prefer to speed things up by using one of the several *high-speed* fixers available. These do the job in about three minutes. Be sure you use a fixing bath of the *hardening type*, which toughens the film emulsion and gives you a negative that scratches less easily. [With some fixers the hardener is supplied separately and added to the solution.]

Wetting agent: This is available packaged in concentrated form. It must be diluted with water before using. Although it is not absolutely necessary, we highly recommend its use to prevent water marks on your film and to promote rapid drying.

How to set up for developing

With time-and-temperature developing, only the loading of the exposed film into your daylight tank needs to be done in total darkness. A lightproof closet will do. Once the tank is loaded, and its lightproof lid is in place, you can perform all the other steps by ordinary light in your kitchen, bathroom, or other convenient location.

Spilled chemical solutions can cause hard-to-remove stains, so protect your floors and working surfaces with a layer of newspaper or paper towels. Keep a roll of paper towels handy for wiping your hands and cleaning your utensils after you have washed them.

Before you start, check to make sure that developer, stop bath [if already mixed], and fixer are all at the same specified temperature. [A temperature of 68 or 70 degrees F. is standard for many developers, but some can be used at higher or lower temperatures. Again–*read and follow the manufacturer's directions!*] If developer, stop bath, and fixer are not all at the same temperature when you check them, follow the directions given in the accompanying illustrations for cooling or warming them.

Rinse off your thermometer thoroughly each time you dip it into a solution to avoid contaminating the next solution you test. And make sure all your utensils are spotlessly clean.

It's helpful to set up your mixed chemicals in the order of their use–developer, stop bath, and fixer. Your other equipment and materials, listed on the opposite page, should be near at hand.

Note: The film data sheet contains developing recommendations. Usually, the only developer or developers recommended are those manufactured by the same company that makes the film. However, other developers, by other manufacturers, also may be suitable. See the time-and-temperature tables in your Technical Manual for various film-developer combinations.

Tips on mixing and storing chemicals

When mixing chemicals, follow exactly the directions given by the manufacturer. Cleanliness is extremely important in film processing, so make sure all your utensils and bottles are absolutely clean. Label your bottles so there's no danger of your mixing them up or contaminating a solution by pouring it back into the wrong bottle. Inch-wide adhesive tape marked with a black-ink marker provides good labels. Don't put developer into a bottle that's been used for some other solution–even though you've washed it and it looks clean.

After you mix powdered chemicals with water, pour the solution into a brown glass bottle and store it away from excess heat and bright light. If possible, fill up your bottle of developer right to the top of the mouth, so that when it's capped no air can interact with the chemicals in solution. This interaction with air–called *oxidation*–weakens the developer even when it's just standing in storage. If the bottle doesn't fill up all the way, or some of the developer has been used, you can raise the level to the top by dropping in some marbles.

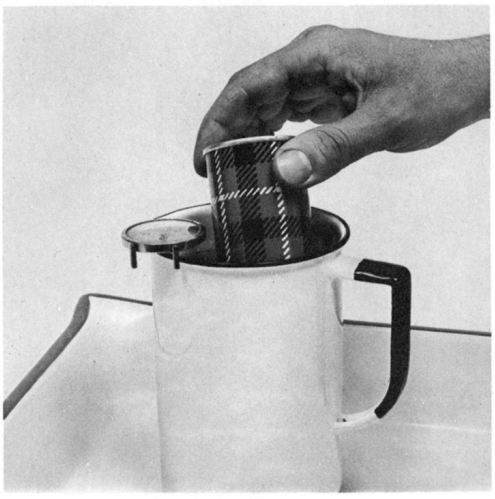
Often you'll mix or buy a *concentrated* [or "*stock*"] *solution* which must be diluted with more water to make a *working solution.* The dilution ratio may be given as 1:1, 1:3, 1:10, etc. This means, add one part of the concentrated solution to as many parts of water as the second number indicates. For example, if you want 16 ounces of working solution, and the dilution ratio is 1:1, you'd add 8 ounces of concentrated solution to 8 ounces of water. If the ratio is 1:3, you'd add 4 ounces of stock to 12 ounces of water.

Usually it's easiest to pour the required amount of concentrated chemical solution into your marked graduate first, then add water to make the required number of total liquid ounces. However, when making a stop bath [about 1 1/2 ounces of 28 percent acetic acid to 32 ounces of water], always put in the water first, then add the acid. This stop-bath solution should be made up fresh before each developing session, and then discarded.

Some photographic chemicals are poisonous. [If so, this fact will be prominently marked on the package.] Store them away from food and out of the reach of pets and children.

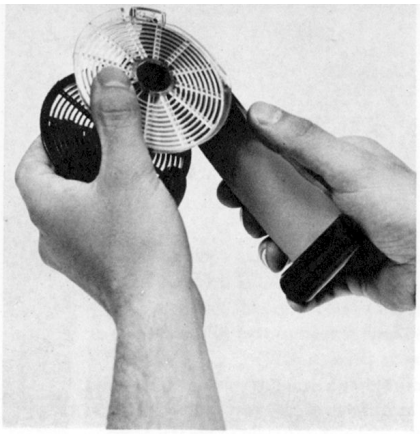
If any sign of irritation appears on your hands, you may be allergic to one of the chemicals–particularly in the developer. Should this be so, wear rubber gloves when handling chemicals or processing film.

How to mix powdered chemicals: Fill your graduate with the amount of water specified in the directions. Make sure it is at the specified temperature. Pour powder in slowly, a little at a time. Stir continuously but gently. [When there are two packets of powder, be sure to dissolve them in correct order.] Stir until all the chemicals are *thoroughly* dissolved.



Cooling the solution: Chemicals often are mixed at a higher temperature than that required for developing. After mixing, add cold water, if this is called for in the directions. If you want to use a warm, freshly mixed solution right away, here's one way to cool it quickly: Drop in a *sealed* container of ice or plastic-covered ice cubes. *Don't* use loose ice–it will melt and dilute your solution.

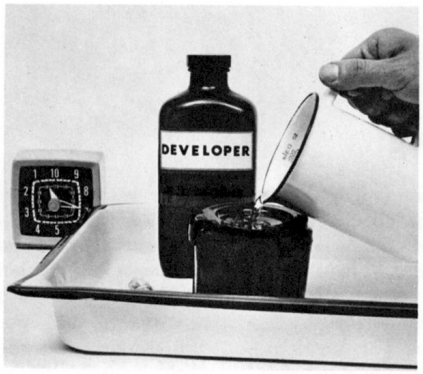
Water bath: Another good quick way to cool a solution to working temperature [and keep it there] is to use a *water bath.* Place the graduate in a large container and add cold water, or put the container under a running faucet, making sure water doesn't splash into the graduate itself. Stir the solution from time to time and check its temperature. Adjust the temperature of the surrounding water to keep the solution in the graduate at a desired temperature. An enameled metal graduate used in a water bath will cool a solution more quickly than will a glass one.



1 Load the tank: Read the directions that come with the tank. Practice loading with a roll of spare film in daylight, with your eyes shut, until you get the knack. Then try it in the dark. When you can load the tank smoothly and quickly without light, you're ready for the real thing.

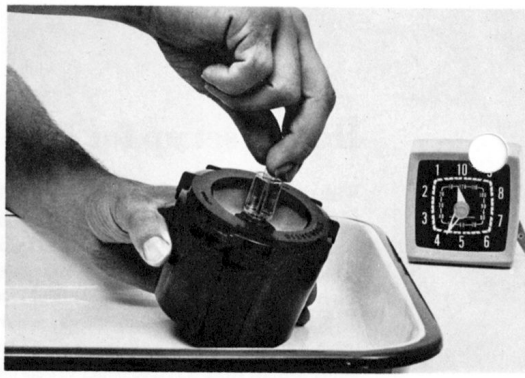
You need total darkness [a room or closet so dark you can't see a crack of light or your hand in front of your face even after several minutes]. Place the tank, reel, lid, and a pair of scissors within easy reach before you turn off the light.

Lights out. To open a 35-mm cartridge, rap the protruding core against a hard surface. Trim off the narrow "leader" of half-width film with the scissors. With roll films, remove the paper backing as you load the film onto the reel. Handle all film by its edges only, except when attaching the end of the roll to the reel. Film generally goes onto the reel more easily if you curve it slightly by pressing the edges as shown here. Put the loaded reel into the tank. Put on the lid. Make sure it's tight. Now you can turn on the light again.



2 Add the developer: First, pour enough working solution of your developer into the graduate to fill your tank. The one shown here has a capacity of 16 ounces. Check the temperature to see that it's correct. Don't let the temperature vary more than a couple of degrees higher or lower. Rinse the thermometer.

Just before you *start* to pour, set the timer for the total developing time the film is to receive. Now pour the developer into the tank through the lightproof opening in the lid. Fill the tank as quickly as possible–you should be able to fill a 16-ounce tank in less than 20 seconds. This is important because you may get streaky, uneven development if you take too long in filling the tank.



3 Agitate: As soon as you've finished pouring in the developer, *tap the tank lightly two or three times against the sink or table edge to dislodge any air bubbles that may have formed on the film surface.* Then *agitate* for 30 seconds.

With a tank like this, you agitate by turning a knob or stick that extends through the lid and rotates the reel. Give the reel a half-turn in one direction, a half-turn in the other, then rock the tank gently from side to side, being careful not to spill developer, then repeat. Agitation brings fresh developer to all areas of the film, insuring even development.

The film should be agitated gently and periodically during developing. Follow the directions that come with the developer. If none are given, try agitating for ten seconds every minute. With some types of tanks you can agitate by slowly turning the tank upside down and then righting it. Three or four repeats during a ten-second agitation is about right.

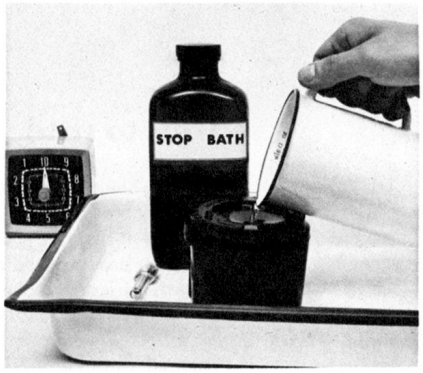
In between agitations, you can rinse your funnel and graduate, and measure into the graduate enough stop-bath working solution to fill the tank. Rinse the funnel. Check the stop bath's temperature. It should be the same as the developer's, plus or minus two degrees.

7 Add the fixing bath: Have your fixing bath ready [in working solution and at the same temperature as the developer, plus or minus two degrees]. Rinse the graduate and funnel, measure out enough working solution to fill the tank, and pour in the fixer. Set your timer to the recommended time. Agitate for about 30 seconds, then for ten seconds every minute until fixing is complete.

8 Pour out the fixing bath: When the timer indicates fixing is complete, pour the fixer back into the bottle for future use. [Of course, be sure to keep concentrated solutions and working solutions in separate bottles.] Now you can remove the light-tight lid. The film is no longer sensitive to light.

9 Wash the film: The developed roll now should be washed for 30 minutes in a continuous flow of water to remove chemicals that may cause fading or staining. *Be sure the wash water remains constant within two degrees of the temperature used for processing solutions.* Here a rubber hose carries water to the hollow core of the reel. Another good method is to put the reel in a large container and use a siphon to create a continuous flow of water. Or you can simply use running water directly from a faucet, with the film reel in a medium-sized container. Position the reel so the water will flow through it freely.

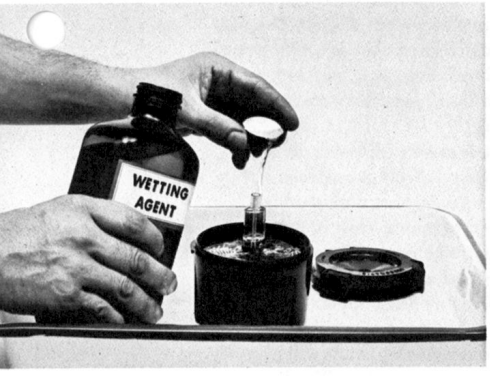
4 Pour out the developer: When your timer tells you development is complete, start pouring out the developer. Do this as rapidly as possible. [Total time in the developer must be controlled *exactly*.] If the developer is the type that can be reused, as here, pour it back into the developer bottle, using your funnel so it won't spill. If it's a "one shot" non-reusable type, pour it down the drain.



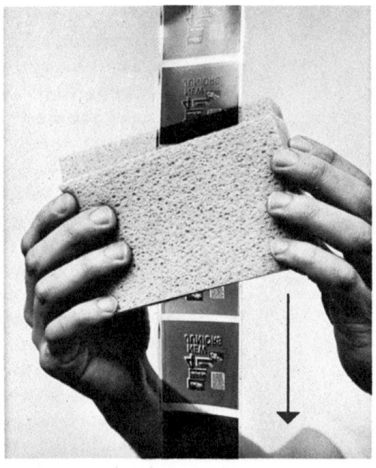
5 Add the stop bath: Now pour the stop bath into the tank as quickly as possible, then agitate gently. With frequent agitation fresh stop bath rapidly halts the action of the developer [usually in one-half to two minutes].

6 Pour out the stop bath: After a minute or two, you can pour out the stop bath. Some packaged kinds can be reused until they change color. If yours is reusable, pour it back into the bottle of working solution. The acetic acid type should be discarded after each roll is developed.

How to develop a roll of film



10 Add wetting agent: After washing the film [and while it's still on the reel], soak it in a properly diluted solution of wetting agent for about 30 seconds. [Follow dilution directions given by the manufacturer.] Here the proper amount of concentrated wetting agent is added to water in the tank with a bottle cap used as a measuring device. A wetting agent promotes even drying, prevents water marks, and speeds the drying process, thus reducing the danger of having dust settle on the wet film.



11 Dry the film: Lift the film from the wetting agent and let the solution drain off. Remove the film from the reel and hang it up to dry, using a film clip. [If you don't use a wetting agent, wipe the film between two *moist* sponges as shown, pulling the sponges once from top to bottom.] Attach a clip to the bottom of the film so it doesn't curl when drying. Dry in a warm, dust-free location.

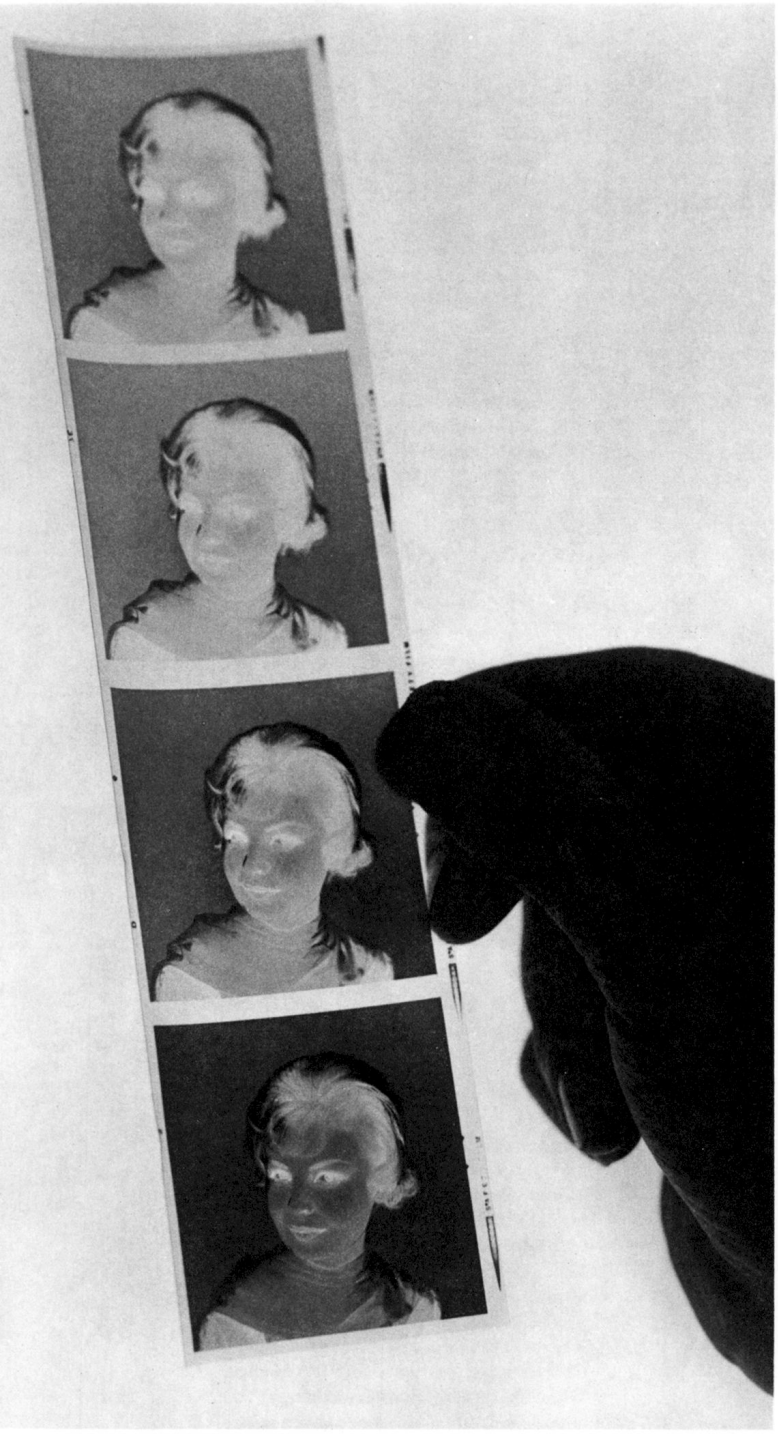
Storing your negatives

After your film is dry, it should be cut into strips of convenient length and stored in a protective envelope. Ordinary business-size [8 1/2-inch-long] envelopes can be used temporarily, but more satisfactory for permanent storage are special glassine *negative storing envelopes* available at most photo dealers.

Do *not* cut your roll or 35-mm film into individual frames. As you'll see in the next lesson, when we show you how to make contact proof sheets, it's usually best to cut 35-mm film into strips of five or six frames each, and 120 or 620 roll film into strips of four frames each. With other sizes of film, cut into strips that conveniently fit the envelope you are using. [Of course, a separate glassine envelope can be used for each complete roll of film.]

Sheet-film negatives should be individually stored in special photo envelopes of the appropriate size.

A simple, effective method of filing negatives is explained in the next lesson, but for the time being we suggest you place the envelopes in a shoe box or other container of appropriate size, and store in a cool, dry place.



Viewing a negative by soft, even light reflected from a white wall or card is a good way to see its density and contrast.

How to read your negatives

Knowing how to "read" your negatives–to analyze them in terms of density, contrast, grain, and sharpness–is an important skill. It can help you discover what, if anything, you did wrong in the preceding steps of exposure and development, and suggest how to correct such errors. In the next lesson, on printing methods, you'll find that it is essential to be able to judge a negative so that you can select the paper, printing exposure time, and special methods required to print it best.

At first it may seem strange to evaluate a picture with all its tones reversed, but the demonstration given on these pages should help you acquire the knack. The best way to view negatives is by soft, even illumination–this makes it easy for you to see and judge the negative's characteristics. We recommend viewing the negative by light reflected from a white wall or a white piece of cardboard, as shown at left, rather than holding it up to a bright window or the direct light of a lamp.

You can judge the negative's density and contrast with your unaided eye, but to see sharpness and grain you may need a magnifying glass–especially with small 35-mm and roll-film negatives.

We have reproduced three negatives and three matching prints on the opposite page. These negatives point up differences in overall *density*.

On the following pages are three negatives and matching prints that emphasize variations in *contrast*. In all cases the matching prints are "straight" and uncorrected. They reveal the density and contrast characteristics of the negative from which each was made.

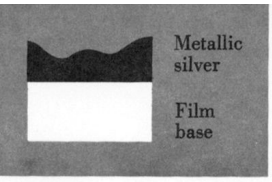
An important point to keep in mind when studying this demonstration and your own negatives is that *exposure and development are closely related*. To achieve negatives of the best quality, *both* exposure and development must be correctly handled.

Density

Density, in photography, refers to the amount of black, metallic silver in a particular area of the negative. It can be measured very precisely with scientific instruments, but for purposes of practical photography you can learn to judge it by your eyes alone. Density depends on *exposure* [how many particles of light-sensitive silver salts were affected by light when the picture was taken] and *development* [how many of these affected particles were converted to metallic silver during processing].

Obviously, most negatives include areas of different density. Very bright highlight areas will have relatively great density–they may be dark and opaque or nearly opaque. Very dark shadow areas will have little or no density–they may be clear or nearly clear. But, in addition to the variations between different areas of the negative, the negative as a whole often can be judged in terms of its overall density–whether it is about normal or tends to be too dense or not dense enough.

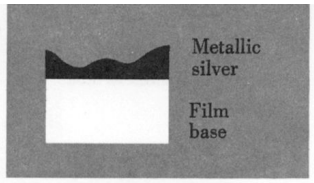
The following three negatives and matching prints will help you judge the overall density of your own negatives. The diagram accompanying each pair of pictures shows a cross section of the negative. The "peaks" in the diagrams indicate highlight areas, where considerable density has built up. These areas, of course, appear dense and dark in the negative. The "valleys" indicate shadow areas, where relatively little density has built up. These areas will look thin and light in the negative.

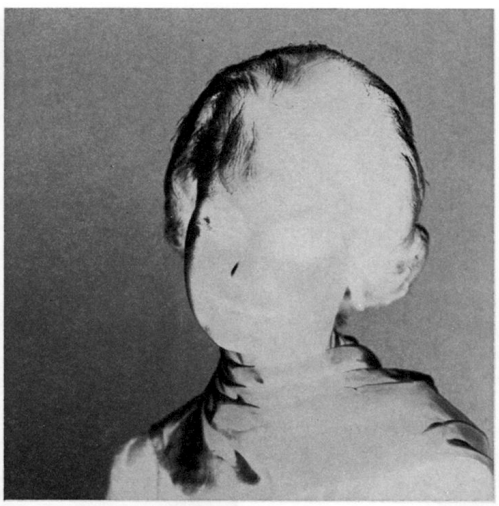


Normal density

When exposure and development are correct, you should get a negative that looks something like the one reproduced at the top. Important light areas won't have so much density that they "block up"—that is, go black and opaque. [Notice that the only completely black detail in this negative is the very intense highlight outlining the girl's hair.] There will be a wide range of middle tones in the negative. Important shadow areas will not be clear and completely lacking in detail. Therefore, a normal negative usually is much easier to print than one that has too much or too little density.

Now compare the negative with the "straight" print made from it. You'll notice the print has a small area of pure white [the highlights in the girl's hair] and a small area of pure black [the eyelashes and pupils in the eyes]. However, most of the print consists of a wide range of middle tones. The print is richly detailed in lighter as well as darker areas. It is pleasing and natural looking.





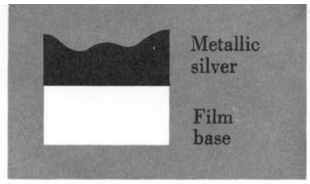
Not enough density

An overly "thin" negative can look something like the one up above. Notice the overall lack of density. Although there is some detail in the stronger highlight areas, the middle tones are weak, and the shadow areas are clear film.

Considerable underexposure, underdevelopment, or a combination of both can produce a thin negative. In analyzing a negative, you may sometimes find it difficult to distinguish the effects of exposure from the effects of development, although—as you'll see in the following set of pictures—contrast can sometimes give you a clue.

If you consistently get negatives that are too thin, check both your exposure and development methods. Ask yourself: Is my exposure meter in good working condition—and did I set it for the correct exposure index? Did I take an accurate reading? Were aperture and shutter speed set correctly? Is my camera working properly? Was the film developed for the full time recommended by the developer manufacturer? Was the developing solution fresh and mixed to the proper strength? Did I maintain the correct temperature?

The uncorrected print from the thin negative is too dark overall, and lacks details in the shadow parts of the face and hair.



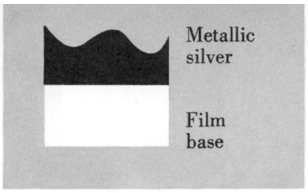
Too much density

The negative is much too dense. It looks black and opaque overall. Most of the lighter areas have completely "blocked up" and even the middle tones are so dense they'll be difficult to print. Although it is not clearly noticeable in a reproduction this size, grain tends to increase with density, and image sharpness tends to become poorer.

Either overexposure, overdevelopment, or a combination of both can result in negatives that are too dense. Check both your exposure and development methods, as suggested in our discussion of the previous example. Avoid the temptation to give your pictures a little extra exposure "just to be safe," or to leave them in the developer for longer than the recommended time.

In hot weather, your developing bath may warm up in excess of the recommended 68 to 70 degrees F. if it stands at room temperature for a period of time. To correct, keep your container of working solution partly immersed in water slightly cooler than 68 degrees.

An uncorrected print from the dense negative is too light overall. It looks pale and washed out and lacks detail in the highlights and light middle tones, such as the bright side of the hair and the scarf.



Contrast

Now that we've considered overall density in the negative, let's look at another important factor, *contrast*. Contrast in the negative refers to the degree of difference between the densest highlight areas and the thinnest shadow areas. It is the difference between the tops of the "peaks" and the bottoms of the "valleys" in the cross-sectional diagrams shown here.

The amount of contrast you get in a negative depends to some extent on the contrast in the subject photographed and on the lighting used. If there are strong differences between highlights and shadows [such as outdoors on a bright sunny day], naturally the negative of your shot will tend to contain a high degree of contrast. And if the subject is low in contrast [as in a picture made on a dull, overcast day], the negative will also tend to have less contrast.

As we saw earlier in this lesson, film, too, has an effect on contrast. Some films tend to be slightly more "contrasty" and others slightly "flatter" [less contrasty] than normal. However, as we pointed out, the difference often is subtle between most films suitable for general picture-taking purposes.

The relationship of exposure to development also has an effect on the contrast of your negatives. Given normal development, overexposure may *reduce contrast* because it tends to build up density proportionately faster in shadow areas than in highlight areas, thereby flattening out the difference between "peaks" and "valleys." Development, on the other hand, tends to *increase* contrast because it often works more effectively on the highlight areas than on the shadow areas, and therefore tends to increase the difference between "peaks" and "valleys."

In a later lesson we'll show you how to use this effect to increase or decrease the contrast in a negative to compensate for lighting that is too contrasty or too flat. But for now it's enough to remember that overexposure can *lower contrast*, and extra developing tends to *increase* it.

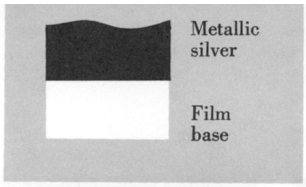
If you sometimes find it difficult to distinguish between contrast and density in a negative, this isn't surprising. It takes experience and a sharp, well-trained eye to judge them accurately. You can only acquire this experience by studying your own negatives and seeing how they behave when you make prints from them.

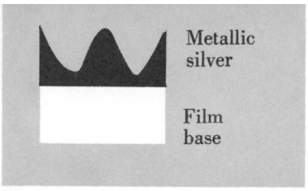
However, it is important to realize that *contrast and density are two separate "dimensions" of a negative, and can exist in different combinations.* For example, a negative can be thin in general, yet contain a high degree of contrast, or it can be thin and flat, or it may exhibit some other combination of density and contrast. As you continue to take pictures, develop film, and make prints, you'll naturally acquire a keener eye for this kind of analysis.

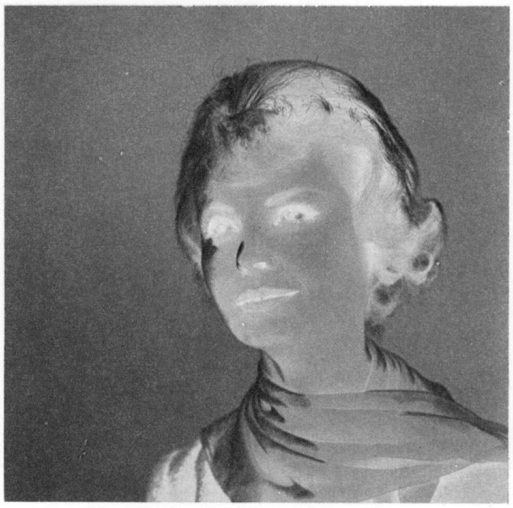
Normal contrast

In the negative reproduced above, contrast as well as overall density is about normal. There is a normal range of distinct tones between light and dark, but the difference between the densest highlight areas and the thinnest shadows is not excessive. This kind of negative can produce a pleasing, natural-looking print. A combination of correct exposure and development does it.

Study the straight print made from this negative. It has pleasing sparkle and a good range of tones between black and pure white. There is a distinct—but not excessive—difference between various shades of gray as in the scarf and the girl's face.







Too little contrast

The negative has too little contrast. It is too "flat"—there is not enough difference between the "peaks" and "valleys," as shown in the accompanying cross section, even though the overall density is approximately correct. It has an even look, without sufficient distinction between the various tones of gray in the negative.

Flatness can be caused by many things. It depends partly on the subject and lighting, of course. *Overexposure* tends to reduce the contrast in a negative at the same time that it adds overall density. *Underdevelopment* tends to lower contrast at the same time that it prevents adequate density from building up. When both overexposure *and* underdevelopment take place, considerable loss of contrast may result, even though the overall density of the negative is about normal.

Therefore, if you consistently get negatives that are too flat, check to be sure you're not consistently overexposing, underdeveloping, or both.

Note that the print lacks contrast, just as the negative does. It is gray and dull, without the sparkle that a pleasing normal print has—even the brightest highlights in the hair are somewhat gray, and there are no strong, rich blacks. All the tones are too close together.

Too much contrast

The contrast between tones is too sharp in the negative reproduced at the top, although the overall density is about normal. The highlights are opaque black, the shadow areas are clear, and the middle tones markedly differentiated. In the cross-sectional diagram, notice the great difference between the peaks and the valleys.

You may get excessive contrast when the subject is harshly lighted with strong shadows and highlights or otherwise contains a very wide range of values. A *slight amount of underexposure* can tend to increase the contrast in a negative. So can *overdevelopment.* When both underexposure and overdevelopment take place, contrast can be considerably increased.

If you consistently get negatives that are thin and contain too much contrast, check your exposure methods to be sure you aren't underexposing. If your negatives seem on the heavy side and also contain excessive contrast, you may be overdeveloping somewhat. Be sure your developer is mixed to the proper strength—and you aren't using it at too warm a temperature or longer than the recommended developing time.

Now let's examine the print made from our highly contrasty negative. See how harsh it looks, with its empty white highlights and intense black shadows that lack detail. It's interesting to compare the shades of gray in the scarf here with those in the previous two examples. The grays are too widely separated in value here, too close together in the print from the "flat" negative, and natural looking in the print from the normal negative.

Faults in developing and how to avoid them

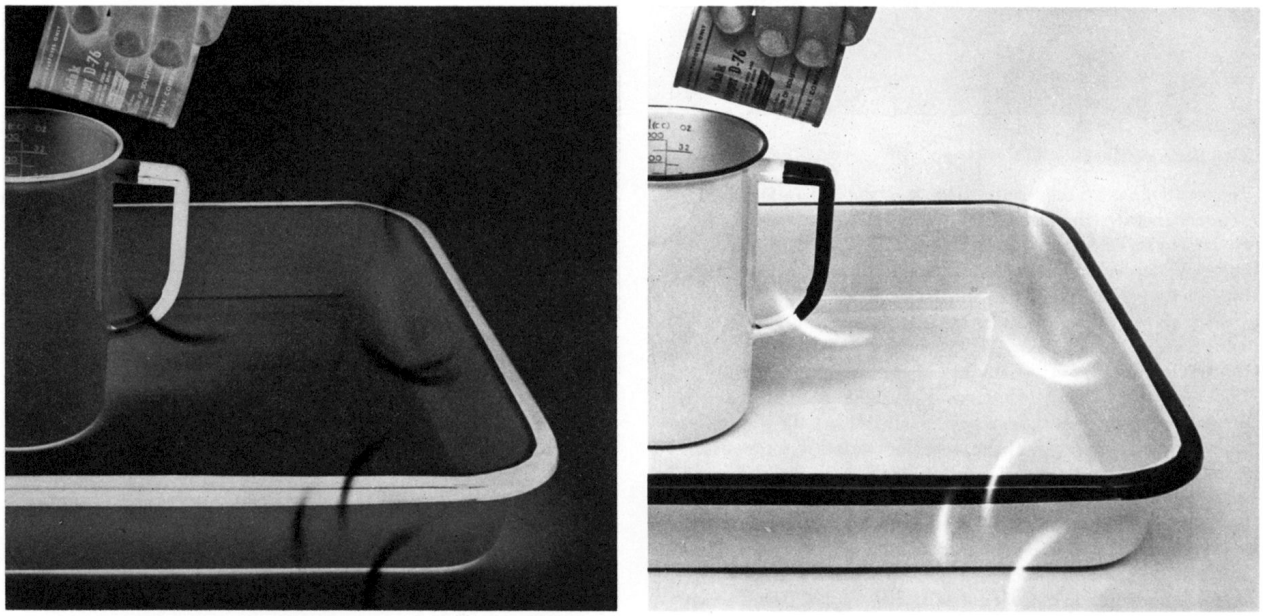
Although developing a roll of film isn't difficult, things do go wrong sometimes. To help you identify and correct mistakes, here's a checklist of common errors. In each case we've reproduced a small portion of the negative and print to give you a close-up view of what the error looks like. If there's something wrong with your negative or print, compare them with these examples to discover the cause and what you can do about it. And remember, most mistakes can be avoided if you faithfully follow the manufacturer's directions and the step-by-step procedure we've demonstrated.

Light streaks

Cause: Light streaks show up as dense black streaks or blotches on the negative, and as areas of white on the print. They are caused by unwanted light leaking onto the film.

Prevention: Sometimes the cause is a faulty camera, so check your equipment. The flexible bellows of a press or view camera can develop light leaks, or the camera back may not be fitted tightly in place. Sometimes the cause is a faulty film cartridge. If roll film is not snugly wound up on the take-up spool, light may reach the edges of the film. Are you sure that these aren't rays of light leaking into the closet where you loaded the film into the developing tank? Did you put the tank's lid on securely before you turned on the lights?

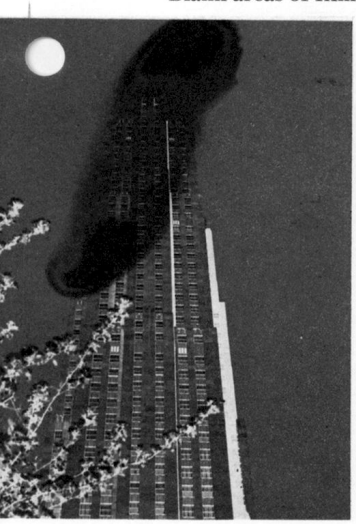
Half-moons

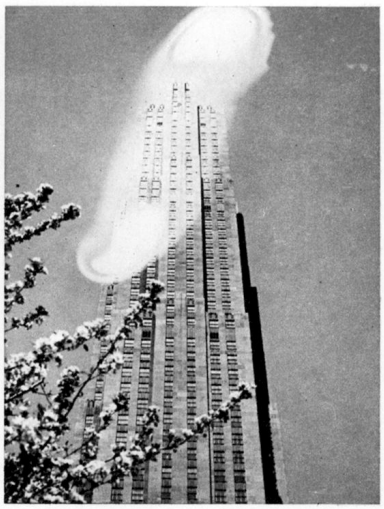


Cause: Half-moons are little crescent-shaped marks–black on the negative, white on the print–which can be caused by the pressure of a fingernail or buckling of the film. Buckling sometimes happens when you are loading film onto the reel of your daylight tank.

Prevention: If the film sticks, don't bend it sharply or try to force it. Handle it gently at all times. If you find yourself having trouble in loading your daylight tank in the dark, practice some more in room light until you improve your skill.

Blank areas of film

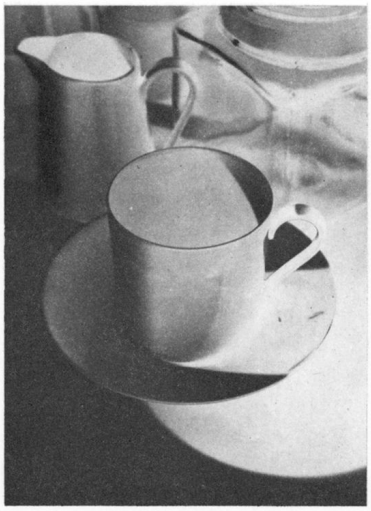


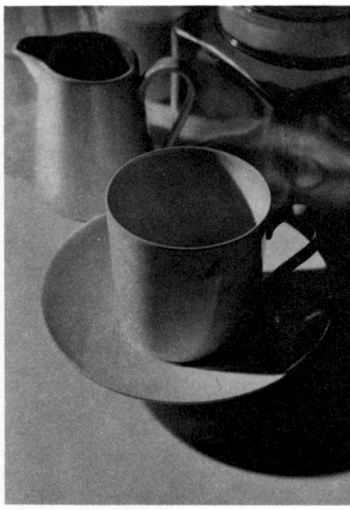


Cause: If you get blank areas of film as shown here, they may have been caused by part of the film sticking together during developing. [The developer can't reach the stuck parts of the emulsion.] If the film sticks during fixing as well, cream-colored areas of emulsion will be visible instead.

Prevention: Wind your film properly on the reel of your developing tank. If the film runs through the spiral grooves provided for it, space for solutions will be left between the coils of film.

Fog and stains from worn-out developer





Cause: An overall *fog*–a strong gray cast that veils the image and sometimes can be seen on the borders of the negative, too–may result if you use worn-out developer. Worn-out developer may also produce stains on the negative. A fogged negative is shown above.

Prevention: To avoid these faults, use your developer working solution to process only as many rolls of films as the manufacturer recommends. [With some developers you can add a certain amount of *replenisher* after you develop each roll. This considerably extends the life of the solution and keeps it at uniform strength.] Also, store your developer properly–in a cool, dark place. Use brown bottles and keep them filled to the top to prevent oxidation. If in doubt about the condition of your developer solution, throw it away.

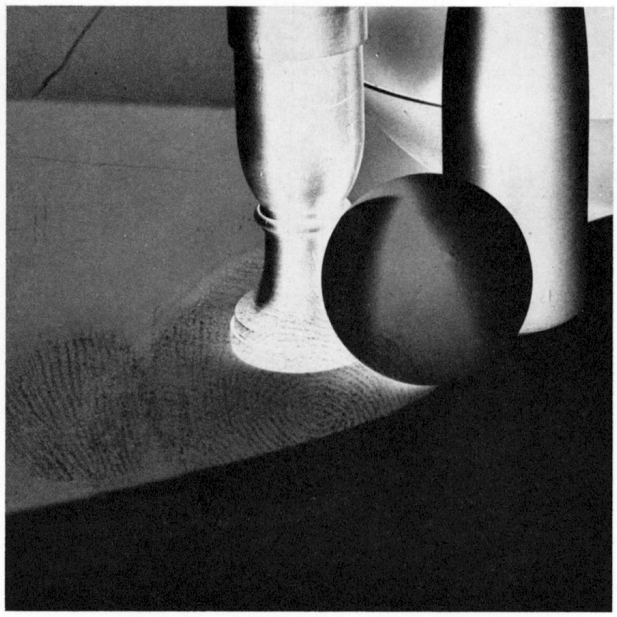
Spots, air bubbles, and dust

Cause: Tiny clear areas on the negative [showing up as black spots on the print] indicate that developer has been prevented from reaching the film at these points. Air bubbles, dust, and particles of undissolved chemicals can cause such spots.

Prevention: Tapping the tank against the sink should dislodge air bubbles. Mixing your chemicals thoroughly–and keeping the solutions clean–will minimize the danger of particles.

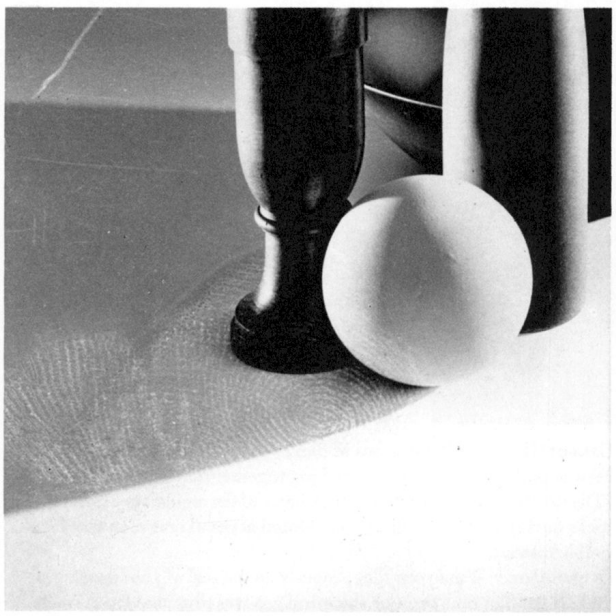
[Dust that settles on the film *after* processing will show up as little white marks on the print. Use a wetting agent to speed up the drying process, and dry your films in a clean, dust-free area.]

Fingerprints and scratches



Cause: Any time you press your fingers against the film before development, they can leave grease or moisture that prevents the developer from acting on the emulsion. An image of the fingerprint will then appear on your negative. A further problem is that the emulsion is soft and it is easily scratched.

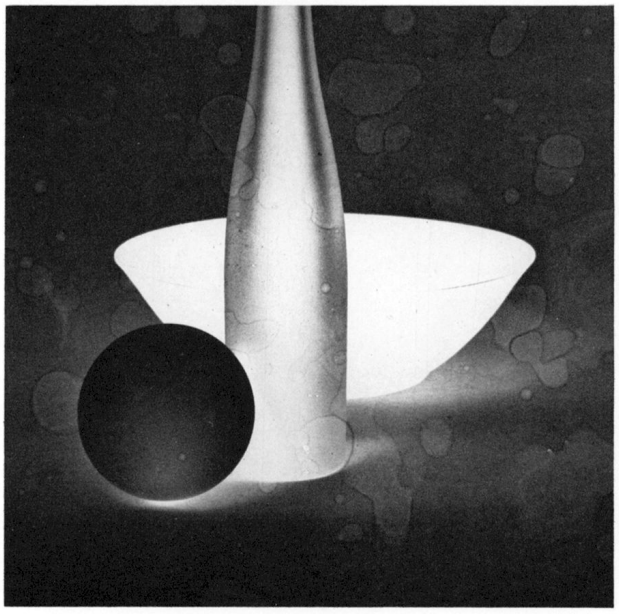
Prevention: Handle the film with extreme care–by the edges only–especially when loading your tank.



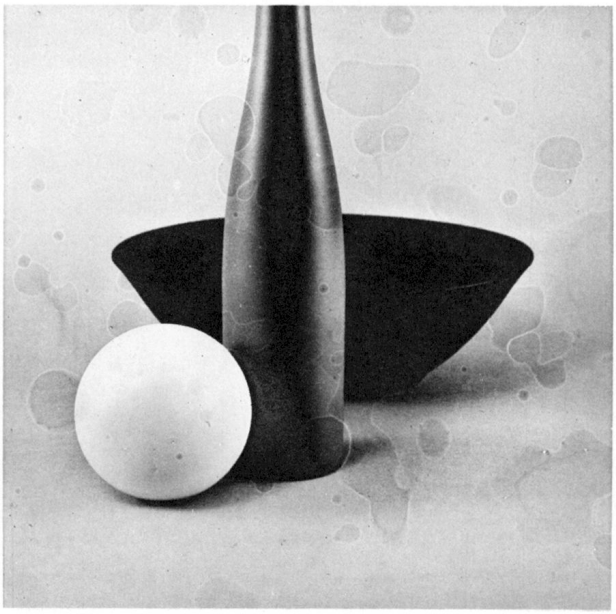
Finger pressure *after* development can leave marks, too, particularly if moisture from your finger eats into the emulsion. Marks on the emulsion side generally can't be removed. However, finger marks on the shiny, *base* side of the film sometimes can be removed with a *film cleaner*, available with instructions at most photo dealers.

Use a hardening type of fixing bath, as we recommend, and your processed films will be less susceptible to scratches and fingerprints.

Water spots



Cause: Water spots are caused by water drops or wet areas that dry after the rest of the film is dry.



Prevention: To avoid them, use a wetting agent, as we have recommended. If you get water marks, you sometimes [but not always] can remove them by washing and drying the film again.

The importance of standardizing

The skills taught in this lesson are essential to your growth as a versatile, well-rounded photographer. Like understanding the controls on your camera, they are part of the basic knowledge that all photographers need [1] to make black-and-white pictures of good technical quality and [2] to achieve the fullest creative control over the medium.

However, you must actually apply these techniques to taking pictures before you can master them. This means more than merely using in a mechanical way what you've learned–as if making a good photograph were a matter of following a recipe. You should strive to adapt the techniques you learn–not only here but in all the lessons–to *your own needs*. Try to apply these techniques creatively, in a way that best expresses what you want to say. Remember that making a good photograph requires *thinking* and *feeling* as well as technical skill.

Your choice of a film, your selection of a filter [or decision *not* to use one], the way you handle exposure, and your procedure in developing, all can play an important part in helping you interpret your subject in a clear, interesting way. The more pictures you take, and the more experience you gain in seeing how film, filter, exposure, and development work together in photography, the greater the degree of control you should have over your medium.

You can considerably speed up your learning this control if you standardize–that is, choose *one* film and *one* developer and work with this combination until you thoroughly understand its performance. We recommended standardization earlier in this lesson, but it is such an important point that it can scarcely be overemphasized.

One reason this advice needs to be underscored is the great variety of films and developers available. The black-and-white photographer may suffer from an embarrassment of riches. There are so many brands for sale, and such a continuous flow of new products, that it's easy to become confused. It's only natural to want to try many of these products yourself in the hope of finding a "miracle" combination of film and developer that will solve all your problems.

The truth of the matter is, there's no such thing as one "best" film or "best" developer. The only "best" film-developer combination is one that you know thoroughly and that fills your particular picture-taking needs. There are many possible combinations that can do this, as is obvious from the different films and developers used by the members of your Faculty. Each has worked out a particular combination or a limited number of combinations that produce the results he wants. And you should do the same.

Regarding film, we have recommended that you first *choose a medium-speed, all-purpose film that will give you maximum versatility*. There are many excellent brands available for all sizes of cameras. The important thing is to select one and to use it consistently until you've achieved a thorough familiarity with it.

Similar advice applies to developer. Choose one of the standard brands listed in your Technical Manual and use it consistently with the film you have chosen.

At this stage in your training we recommend that you follow the exposure index supplied by the film manufacturer. However, as you gain more experience with the entire photographic process [especially the way that exposure, developing, and printing relate to each other], you may decide to work out your own personal exposure index. Many experienced photographers, including some members of your Guiding Faculty, do this. They use an exposure index for a particular film that may be higher or lower than the number recommended by the manufacturer. This is not done arbitrarily, but only as the result of thorough knowledge of how a particular combination of film and developer perform. In later lessons we will discuss this subject in detail. However, for the time being, you can simplify matters for yourself and speed up your mastery of photographic fundamentals if you *follow the manufacturer's ratings*, using the developer he recommends or a similar one.

In learning how a particular film and developer "mate," and how to achieve the best results with the combination, it's very helpful to keep a careful record of your exposures and your developing times. Jot down this information in a notebook as you go along and refer to it as you analyze your negatives for density and contrast. This can be a highly valuable part of your training.

By standardizing on the two vital factors of film and developer, you'll make it easier to judge your results. You'll be better able to recognize serious errors due to wrong exposure or incorrect developing time or temperature, and to avoid these mistakes in the future. After you've worked with a particular combination for a time, you may find that you're consistently getting negatives that are slightly too heavy or slightly too thin for your needs. Then you'll be able to make minor adjustments in exposure or developing time to get exactly the quality of negative you want.

Exactly what "normal" density is will vary somewhat from photographer to photographer. It depends on the method, materials, and equipment used in printing, and on the quality of print the photographer likes. For example, some 35-mm photographers prefer to produce negatives that are slightly on the thin side because they find this aids fine grain and image sharpness, which is particularly important when making big enlargements from small negatives. On the other hand, some photographers using larger negatives prefer them slightly on the "meaty" side, because it gives them a quality of print they prefer. You won't be able to make a final, precise decision about your own personal standard of "normal" density until you make prints, as taught in the following lesson. But you should begin to judge negatives now, as we have shown you here, and get the "feel" of this important aspect of photography. Look at the shadows. Is there anything there? Look at the highlights–are they very dense and blocked up? Look at the negative overall–does it seem generally too dark, too light, or about right?

Later, after you've gained a thorough knowledge of your "versatility" film-developer combination, you may want to branch out. For example, you might choose a particular brand of slow-speed, "thin emulsion" film and one of the special developers designed to give greatest possible image sharpness. Or you might choose a very fast film and a powerful developer designed to give greatest possible speed. But the same advice regarding standardization applies here, too. Choose *one* film and *one* developer from each "family" and use it consistently until you intimately know its performance.

Standardization not only can help you more quickly achieve pictures that are technically good–it also can help you acquire creative control. As you explore the possibilities of your film-developer combination, adopt a searching, questioning attitude. Ask yourself, for example: How much should I underexpose to get a particular silhouette effect that I want? Or overexpose to wash out an obtrusive light background? Will a particular filter give me the effect I need if I increase exposure by the full filter factor? Or is it better to underexpose slightly?

After you've worked with a certain film and developer for a time, you should be able to answer such questions with confidence, and be better able to predict and control results. You should find that you can more effectively translate what you see into the eloquent picture language of black-and-white photography.

Technical notes on the photographs

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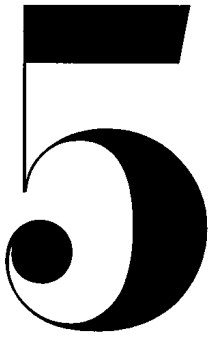
Lesson



Contact printing and enlarging

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In black-and-white photography, the print *is* the picture—the photographer's completed visual statement. The values that were reversed in the negative are converted to their normal relationship in the print. A *contact print* is exactly the same size as the negative that produced it. If a magnified image of the negative is projected onto printing paper, the result is called an *enlargement.* Both a contact print [shown in the small insert] and an enlargement from the same negative are reproduced above.

The art of printing

Making a print is the climax in the chain of events that begins when you first visualize the picture in your mind's eye or start to explore the subject with your camera. In the previous lesson you learned how to develop a negative. But this is only a halfway step. Your picture doesn't come fully alive until you make a print from this negative. In the negative, lights and darks are reversed, but in the print these tones are restored to their original relationships. This is the point where your vision–the way you saw the subject at the instant you tripped the shutter–is materialized into its final form by the magic of light and chemistry.

The print is your picture–your complete, visual statement, as other people will see it. It must communicate what you want to say–tell the story and convey the mood or emotion you have in mind. It is what a client or critic will see and judge your performance by. The print, in short, is the final product of all the imagination and effort that went before.

It's important to acquire skill in handling this vital, final step in the photographic process. Creativity doesn't necessarily end with taking the picture, but continues in the darkroom as well. In printing, you can amplify and refine the thinking and seeing you did at the time you took the picture. Here's your chance to correct minor errors made at earlier stages and to place the mark of your own personality on the print–to express your ideas in clear, strong form.

In this lesson we'll give you the basic principles and methods you need to know for black-and-white printing. We'll demonstrate creative controls you can use to improve the quality of your prints and make them communicate more effectively. Finally, we'll take you into the darkroom of a master photographer-printer–Philippe Halsman–to watch him make a print, and to learn his approach and working methods.

Printing is an art–a complex and challenging one. You shouldn't expect to learn all about it in one lesson, or in just a few printing sessions. To perfect your skill you'll need to gain considerable experience in the darkroom. However, by studying this lesson carefully–and doing all the lesson assignments–you'll acquire a solid grounding in the basic methods of making a good print, and you'll more easily master the advanced printing techniques we'll explain later.

We suggest that you read this entire lesson through before you actually begin to work. Then, after you have a broad overall view, go back and carefully reread each section before you do the various assignments. Also make sure you have all the necessary equipment and materials we have listed, and that you have read and understood the manufacturer's directions for their use.

The printing process

In printing, just as in taking a picture, light is the prime mover, the essential source of energy that makes the process work. To make a print, you use a special *printing paper* coated on one side with a light-sensitive emulsion. This emulsion, like the emulsion on your film, contains silver salts that react to light. You must keep printing paper shielded from light except when you actually expose the print, but you can handle it safely under the illumination of a specially colored darkroom *safelight.*

The negative is like a master stencil from which you can produce any number of copies. To make a print, you expose a piece of printing paper to light which *passes through the negative.* Different parts of the negative transmit different amounts of light, depending on the density of each particular area. This exposure puts a latent image on the printing paper. The latent image is made visible and permanent by processing the paper in chemical solutions similar to those you use for processing film.

Clear, or nearly clear, parts of the negative [remember, these represent *dark* tones in the original subject] let much light pass through. Corresponding parts of the paper emulsion receive relatively great exposure, and a large number of light-sensitive silver salts are affected. Processing converts these silver salts to black, metallic silver. Therefore, such areas are *dark* in the print, just as they were in the subject.

Dense, dark areas of the negative [representing *bright* tones in the subject] block all or some of the light from reaching the paper. Few silver salts are affected in the corresponding parts of the paper emulsion. After you develop the print, these areas contain little or no black silver. Here the print is *light* in tone, as was the subject.

Thus the print reverses the lights and darks, the highlights and shadows, of the negative. It is a positive reproduction of the negative, with values restored to the way we see them.

In printing, you can actually watch the developer make this final, positive image visible. This moment when the image begins to appear on a blank piece of printing paper–when you first see your picture materialize before your eyes–is one of photography's unique and unforgettable experiences.

Contact prints and enlargements

To make a print that is exactly the same size as the negative, a piece of printing paper and the negative are held tightly together during the exposure to light. You can use a glass and wood *printing frame,* which clamps the negative and paper together while you expose them to light from an ordinary household electric light bulb or other source. Or you can use a special *contact printer,* which contains its own built-in light source and a means for holding the paper and negative together. Prints made by such methods are called *contact prints* because the paper is actually in contact with the negative during exposure. Contact prints are most commonly used by professionals as preliminary proofs to show to customers, to study before making a final print, and for record purposes.

To make a print that is larger than the negative, you must use a projection device called an *enlarger.* You put the negative in a holder between the enlarger's light source and its lens. When you turn on the light to make the exposure, the lens projects a magnified image of the negative onto your printing paper. This method is called *enlarging* or, less commonly, *projection printing,* and the resulting print is an *enlargement* or *projection print.*

In professional photography, the final print delivered to a client or customer almost always is an enlargement, and when you hear professionals talk about "printing" and "prints," they usually mean enlarging and enlargements. We'll follow this commonly accepted terminology. [When we mean only contact prints, we will specifically call them that.]

Until a black-and-white picture is realized in a good print, it remains only partly finished–no matter how beautiful, original, or striking it may potentially be. Therefore, don't consider printing to be a routine, mechanical process. It deserves just as much concentration, energy, and imagination as you give to picture-taking itself. If you approach it with enthusiasm and the determination to work hard, you'll find the rewards are great–in self-satisfaction and in your increased creative control over the medium of black-and-white photography.

Making a contact print

The easiest way to learn printing is to begin by making contact prints–prints that are exactly the same size as the negative. Contact printing is not difficult, nor does it require elaborate equipment. When you learn how to make good contact prints, you acquire a useful skill and master basic principles of printing which can also be applied to the more refined and complex art of enlarging.

Photographers working with large sheet film–8 x10, for example–sometimes make a contact print that is intended to be the final photographic statement for display or reproduction. But with smaller sizes of film, most professionals make enlargements. Contact prints, however, serve a very important preliminary role; they are an economical and time-saving method for seeing the results of a shooting session and choosing which pictures to enlarge. In portrait work, for example, the customer may receive a set of contact "proof" prints from which to make his selection of the pose and expression he likes best. An art director or picture editor may want to see contact prints of everything that was shot for an assignment. You, as a creative photographer and a good craftsman, will find that a careful study of a contact print before making an enlargement can help you achieve the result you want.

We'll first demonstrate how to make a contact print from a single frame of film. Once you've familiarized yourself with the step-by-step processing procedure and gained a little experience in controlling the brightness and contrast in a print, you should be ready to make contact "proof sheets." These are large [usually 8x10] sheets of printing paper on which several frames are printed simultaneously. For example, an entire roll of 35 mm or 120 roll film, or four 4x5 negatives can be printed at the same time on one 8x10 sheet of printing paper. This way of checking the results of your shooting can save a great deal of time and effort over making an individual print of each frame. Also, these 8x10 sheets are convenient for filing as a record of your shooting. We'll give you detailed instructions for making proof sheets later in this lesson.

Setting up a darkroom

To make contact prints, you need a darkroom–either permanent or temporary. As with film developing, a kitchen or bathroom often is the most convenient room to convert to a temporary darkroom because it has running water available [to wash prints in the case of printing] and surfaces that are easily cleaned if you spill any of your chemical solutions. However, it's not essential that the room you use have running water. The prints can be washed in another room later, after you have completed your printing session.

Unlike film developing with a daylight tank, printing does require a darkened room. If you want to print during the day, you must make sure that windows and doors are *completely* light-tight. Of course, if you print after dark, the problem of bright light leaking into the room is greatly reduced. An easy way to make your room adequately light-tight is to tack or tape some opaque material [oilcloth works well] over the window frames. An additional flap of material taped to the bottom of the door will prevent light from leaking in from other rooms in the house. When setting up your darkroom it's a good idea to arrange two separate working areas: [1] a "wet" side for mixing and pouring, and to hold your trays of solutions, and [2] a "dry" side for other operations.

All the tools and materials you'll need for contact printing are illustrated and listed [with a brief description] on the facing page. Make sure you have all these items on hand, and that you've read carefully the directions supplied with the printing paper and chemicals.

Arrange your four trays in a row in the "wet" working area of your darkroom. The trays, in sequence, are for developer, stop bath, fixing bath, and water. This *sequence* must be followed, but it can run from left to right or right to left, depending upon which is more convenient in your particular work area. If you have a sink with running water, naturally you'll arrange your trays in order so that the water tray [for washing] can be placed in or near the sink.

Just as with film developing, it's a good idea to protect the floor and working surfaces with paper towels or newspapers, because spilled chemicals can cause stains. Also, clean up thoroughly after you've completed a printing session.

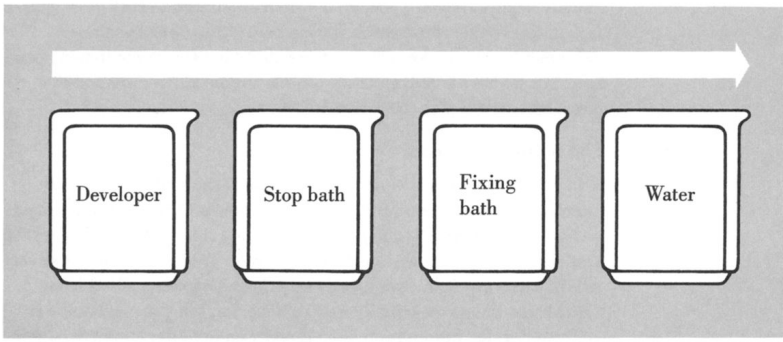
Prepare your paper developer according to the manufacturer's instructions and pour it into the first tray. Mix fresh stop bath using the same ingredients and dilutions you use to develop film, and pour it into the next tray. Next, add properly diluted fixer to the third tray. Don't be skimpy with these solutions–be sure to put enough into each tray to cover the paper adequately. Check the temperature of your working solutions before you begin. Usually 68 degrees F. is recommended. Put the fourth tray in the sink or bathtub so that you'll be ready to wash the prints with running water, and set up the hose and siphon if you're using them.

Cleanliness is just as important in printing as it is in developing film. Clean your trays before you start, and wash your graduate thoroughly before you mix each solution. Don't put your trays so close together that there is danger of solutions spilling over from one to the other.

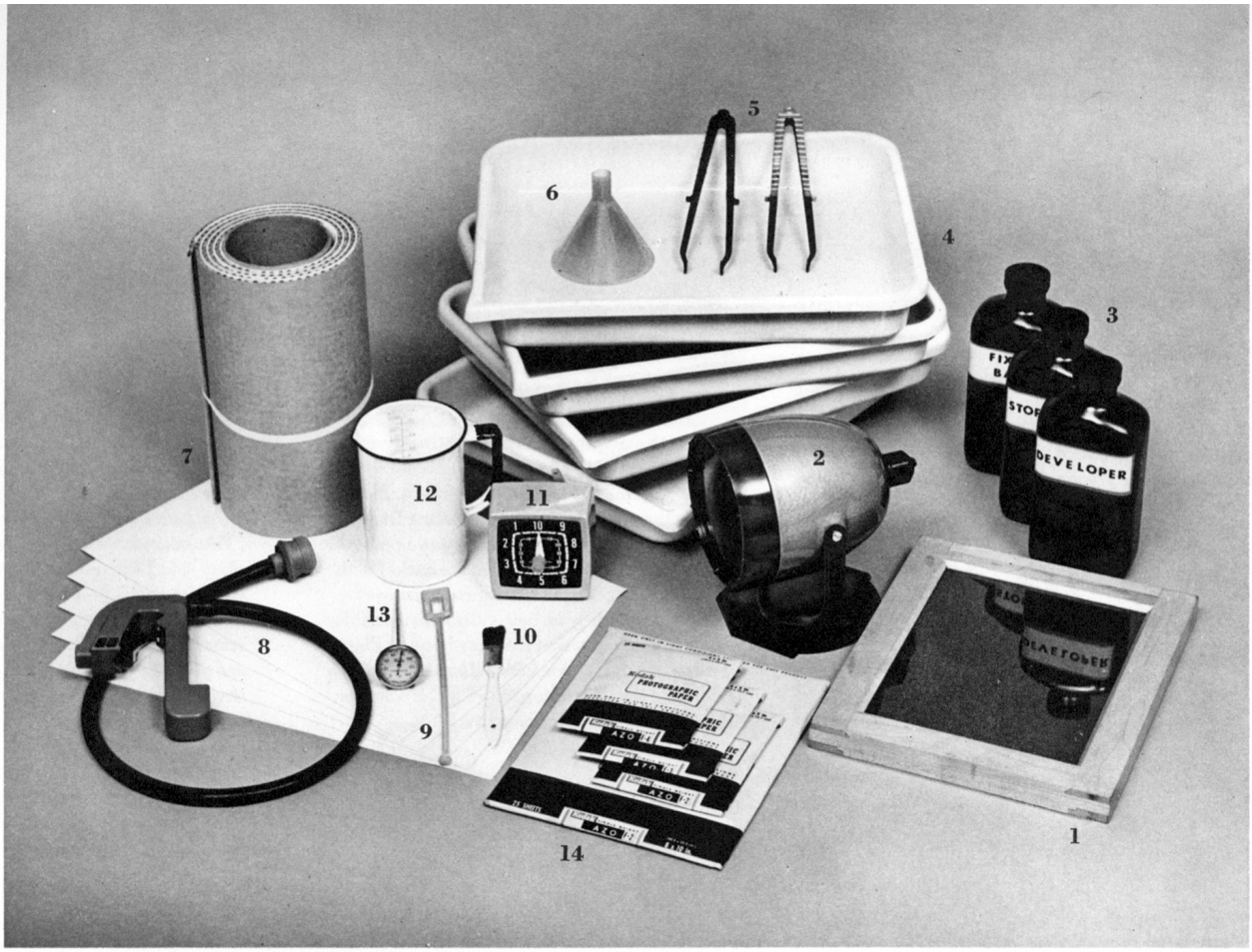
We recommend that you buy tongs of different colors, or mark one differently from the other, so you won't contaminate the developer with stop bath or fixer. One pair of tongs should be used *only* for the developer, and the other for *both* stop bath and fixer. It's a good idea to label your trays "developer," "stop bath," and "fixing bath" [using adhesive tape and a black marker] and to keep each tray for the one solution indicated. This eliminates one other chance for contaminating the solutions.

Now place your safelight in position. If it contains a 15-watt bulb, as many small darkroom safelights do, it should be no closer than four feet to the *developing tray*. For larger units, follow the manufacturer's directions. All steps from opening your package of paper through fixing should be done with the *room lights off* and the *safelight on*.

For step-by-step directions, turn the facing page.



Correct sequence of trays for printing is shown above. First the print goes into the developer, then the stop bath, then the fixing bath, and finally the water. The arrangement here permits the photographer to work from left to right, but the trays can be set up for right-to-left use, with the developer on the extreme right and the water on the left.



Here's what you need for contact printing

1 A printing frame. This serves to keep the film and paper in firm contact during the printing exposure so you will get a sharp, clearly defined picture. The illustration shows an 8 x 10 printing frame. It includes a sheet of glass and a removable back with clamps for holding the back tightly in place. We recommend a frame of this size now because you'll find it useful later in making 8 x 10 proof sheets of an entire roll. Other types of printing frames have a hinged back. Also available are contact printing boxes with a built-in light source for making exposures. Instead of a printing frame or printing box, you can use an 8 x 10 sheet of plate glass about one-fourth inch thick. Place this on top of the negative and paper to hold them together during exposure. The glass must be heavy enough to hold the film and paper flat.

2 A safelight. This is a darkroom lighting unit which provides sufficient illumination to work by but, because of a special colored filter, does not affect the printing paper. You can get colored safelight bulbs, but we recommend purchasing this complete safelight unit, which has clear bulbs and interchangeable colored filters to use with different types of photographic paper. Always choose the safelight filter recommended by the manufacturer for the type of paper you are printing on.

3 Three 1-quart, wide-mouthed, brown glass bottles. The same type used for film-developing solutions is suitable. Fill one bottle with paper developer–probably a different solution than your film developer–one with your stop bath, and one with your fixing bath. [Of course, if the stop bath and fixer stock solutions you mix for film developing can be used for printing as well, there's no need to have separate bottles.]

4 Four darkroom trays. These are available in plastic, hard rubber, enamel, and stainless steel, and come in a variety of sizes. Stainless steel is the most durable–and the most expensive. However, the less expensive plastic, rubber, or enamel trays are satisfactory, too. Although small trays [4 x 5- or 5 x 7-inch size] are adequate for making contact prints of single negatives, we suggest that you buy the bigger 11 x 14-inch trays now so you can use them later for processing proof sheets and enlargements. [Most enlargements made for professional use measure 8 x 10 or 11 x 14 inches.]

5 Two print tongs. Get these in different colors or label them so you can easily tell them apart. Use one with the developer and the other with the stop bath and fixing bath.

6 A small glass or plastic funnel.

7 Blotters or a blotter roll You'll use these in drying your prints.

8 Hose and siphon. Although not absolutely necessary, they will circulate the running water more efficiently when you wash your prints.

9 A glass or plastic stirring rod.

10 A fine sable brush for cleaning off your negatives.

11 A darkroom timer which reads in seconds and minutes.

12 A 1-quart mixing graduate.

13 A dip-in type darkroom thermometer.

14 Contact printing paper. This is photographic paper specially designed for contact printing rather than enlarging. [Enlarging paper generally is faster–more sensitive to light–than contact paper.]

Printing paper comes in two weights–single and double. We recommend the heavier *double-weight* paper for your school assignments because it has less tendency to curl and holds up better under handling and mailing.

Printing paper comes in a variety of surface tints and textures. We suggest a standard *glossy white* surface for your purposes now.

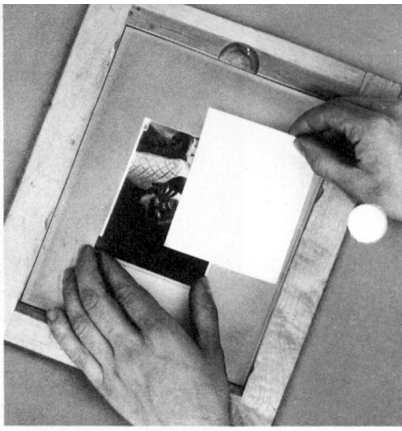
Another important difference between papers is their *contrast grade*. A *normal-contrast, No. 2 grade paper* is designed to produce a print of normal contrast from negatives of normal contrast. We'll demonstrate the effect of different contrast grades shortly. Most of your printing probably will be done on No. 2 paper.

The chemicals used in contact printing are paper developer, stop bath, and fixing bath. There are developers designed especially for use in making photographic prints. [See your Technical Manual for a list of commonly available brands.] You can mix a good stop bath for printing by diluting 28 percent acetic acid with water as directed for film developing in Lesson 4. Many fixers are suitable for both prints and film, but they may require different dilution for each purpose.

Contact printing, step by step

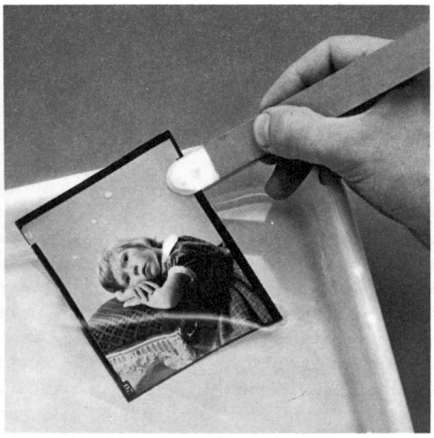
For your first attempt at contact printing, choose a properly exposed and developed negative that has normal contrast and density. It should be 2 1/4 x 2 1/4 or larger in size. If you don't have a negative of your own that's suitable, use the practice negative supplied for your School Assignment.

1 Place the negative in the printing frame: Turn out the room lights in your darkroom so that the only illumination is from the safelight. Make sure that the glass of the contact printing frame is clean and free from dust. Put the frame on the table with its glass side down and open the back. [With this model the back can be completely removed.] Brush the film lightly on both sides with the sable brush to remove any dust that may be on it. Place the negative with its *emulsion side up* on the glass, as shown in the illustration above. [The emulsion side is the *dull* side of the negative.]

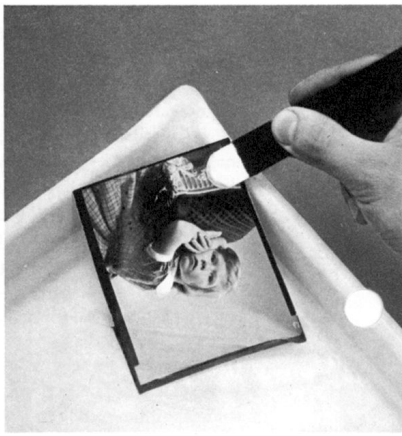


2 Place paper on negative: Open your package of printing paper and place a sheet *emulsion side down* on the negative in the printing frame. [The emulsion side of the paper is its *shiny* side.] *Remember, the emulsion side of the film always should face the emulsion side of the paper.* Return the remaining paper to its inner envelope and place the envelope inside its outer envelope. Do it *now* so you won't forget. If you turn the light on with the paper out of its protective envelope, you'll spoil the exposed sheets. Make sure that the negative and paper are properly aligned, then close and lock the back of the frame.

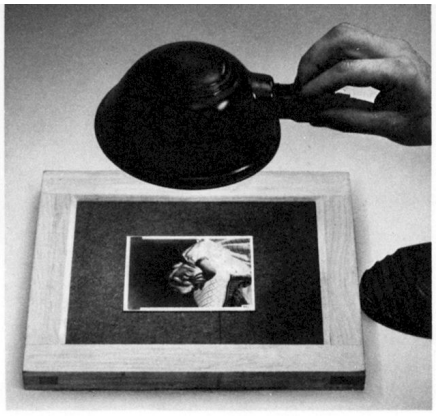
6 Remove the print from the developer: When development time is over, lift the print by a corner or edge with your "developer" tongs, and let the excess liquid drain off the paper into the tray. This should take only a few seconds. For safety, hold the sheet so the emulsion [shiny] side faces away from your safelight. Remember the emulsion is still light sensitive and shouldn't be exposed needlessly even to the direct light from the safelight.



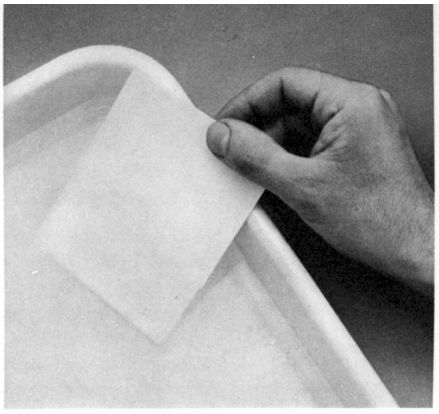
7 Place the print in the stop bath: Still holding the print with the "developer" tongs, drop the paper into the stop bath, *making sure your tongs do not come in contact with the stop-bath solution.* Rest the tongs across a corner of the developer tray, pick up the "stop-fixer" tongs and agitate the print for 10 to 15 seconds. Then lift the print [with the same tongs], and let the excess solution drain into the stop-bath tray for another few seconds.



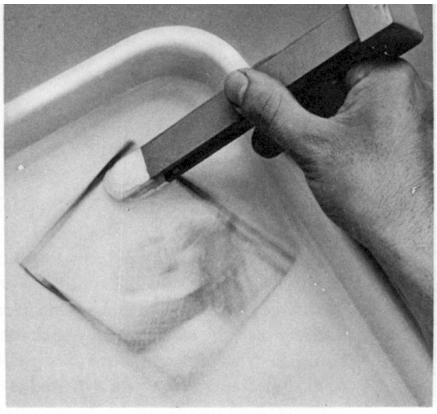
8 Fix the print: Now slip the print into the fixing bath—the solution that "fixes" the image by making the paper emulsion no longer sensitive to light. Agitate the paper initially for 10 to 15 seconds, using "fixer" tongs as shown here, and at frequent intervals thereafter. Fix for the total fixing time indicated by the manufacturer. However, don't overfix by leaving the print in the fixer for much longer than the recommended time. Overfixing can bleach out parts of the print. After about 1 minute of fixing in fresh hypo, you can turn the room lights on.



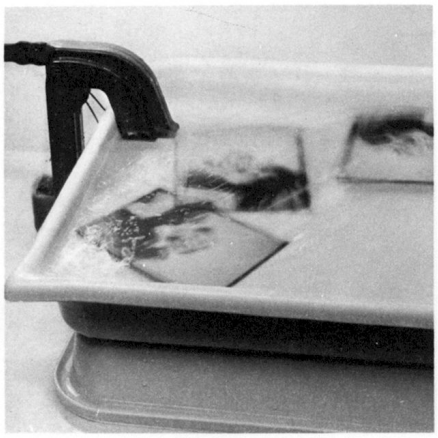
3 Make the exposure: Use a light from an ordinary tungsten bulb, preferably in a reflector as shown here to give even, uniform illumination. Printing exposure times will vary depending on the density of the negative, and the particular combination of paper and developer used. However, as a starting point, try an exposure of about 15 seconds with a 25-watt bulb held 12 inches from the glass side of the printing frame. Measure this distance with a yardstick or tape measure and *use the bulb at the same distance each time you expose.* Then you can vary exposure, if necessary, by changing the length of time you leave the bulb turned on. If you change the distance between the light source and the printing frame, you'll add another variable to exposure that can cause great confusion.



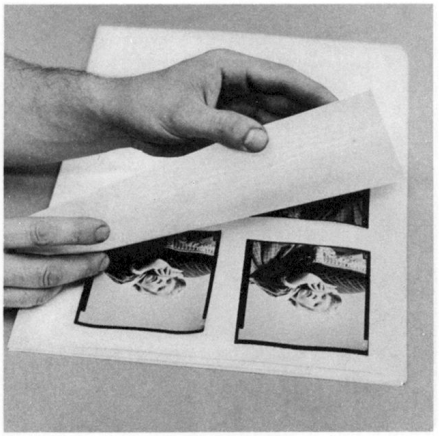
4 Place the print in the developer: After the exposure has been made, remove the paper from the printing frame and slip it quickly into the developer. Be careful not to get your hands wet during this operation–or dry your hands carefully if they do get wet so that you don't carry over drops of developer into the dry area of your darkroom.



5 Develop the print: To insure full, even development, agitate the paper gently during the entire time it is in the solution. Use your tongs for this, moving the paper slightly. Or rock the tray of developer slightly from side to side, being careful not to spill any. Follow the manufacturer's directions for developing time. [Usually, this is around 1 to 2 minutes.] At this stage you'll be able to see the invisible "latent" image become visible on the paper.



9 Wash the print: Now put the fixed print into the water tray. Wash for one hour in running water, preferably with a siphon [as shown here] and a hose to keep a continuous stream of fresh water in circulation. The temperature of the wash water should be approximately 65 to 75 degrees F. for the most efficient washing. If the water is too cold, the one-hour washing time will not be sufficient to remove all chemicals. If the water is too warm, the paper's emulsion may be softened and harmed. It's safe to let several prints accumulate in the water of the fourth tray during the printing session. However, change the water frequently because every time you add another print, you add a little more hypo to the water and, after your printing is finished, wash *all* the prints at the same time for a full hour in running water.



10 Dry the print: Remove the washed prints one at a time and let the excess water drain off. First, place each print face up on a clean piece of blotter and wipe the front with a sponge. [A fine-textured cellulose sponge such as you use in developing is suitable.] Then, turn over the prints and wipe the backs. Cover the prints with a second blotter sheet as shown above and let them dry under moderate pressure–put stacks of books or magazines on top of the covering blotter sheet so your prints will dry flat. Drying may take several hours, overnight, or even longer, depending on the temperature and humidity of the room.

Alternate drying methods

Instead of blotter sheets, you may prefer to use a *blotter roll.* Unroll it, place the prints face down on the blotter portion, then roll it up again [with the prints inside] and tie it. A large blotter roll may be unwieldy for one person to handle, but it has the advantage of holding a large number of prints in a small space when rolled up. Prints tend to curl toward their emulsion side when they dry. A blotter roll holds them curled the other way and, as a result, the prints tend to dry flat.

For faster drying, you can obtain an electrically heated print dryer. These come in a variety of sizes and prices from small, inexpensive units for home darkroom use, to elaborate professional models.

If your prints don't dry flat enough, try using a *print-flattening solution* after washing. This is a commercially available chemical solution which helps keep the print from curling as it dries.

Two basic printing controls

The best way to make a good contact print is to begin with a good negative. Unfortunately, it isn't always possible to start this way. Sometimes you'll have to make prints from negatives which are too dense or too thin, too contrasty or not contrasty enough. The first print you make from such a negative may look too dark, too light, too harsh, or too flat. It is then that you will need to use the two basic controls of printing: *exposure* [to make the print lighter or darker] and *graded paper* [to increase or decrease contrast]. Let's now take a look at each of these important controls. The three pictures on this page show how exposure controls print brightness, and the pictures on the facing page show how paper grades can control contrast. You may find it helpful to compare your own contact prints with these examples as a guide to improving the quality of your work.

1 Exposure controls print brightness

The amount of exposure you give a print is the most effective way to make it lighter or darker. If the print is *too dark*, too much light may have fallen on the paper and you should *decrease exposure time*. If the print is *too light*, the reverse may have happened. Too little light may have reached the paper, and you should *increase the exposure time*. [Remember, use your light source at the same distance from the printing frame with each exposure so you can control exposure accurately by time alone.]

The length of time you leave a print in the developer also can affect its lightness or darkness. However, for best quality we strongly recommend that you *keep your developing time constant*, following the manufacturer's instructions.

Don't try to save a print that "comes up" too fast in the developer by removing it from the solution before the recommended time has elapsed. If you do "pull" the print too early, you may find that the blacks are not strong enough and the light areas of the print lack detail.

On the other hand, don't leave the paper in the developer too long. Shadow areas may go dark and lose important detail, and the overdevelopment may gray the highlights and reduce print brilliance. Study the three prints below to see how different exposures can produce different results from the same negative.

Too much exposure

Here the print got too much exposure. It is too dark overall. The snow is such a dark shade of gray that it doesn't look natural. The two figures are recorded as a pure black silhouette without detail or separation between them. The one area of pure white in the picture–the highlight on the walk behind the women–now stands out so strongly in contrast to the pure black of the figures against it that it attracts too much attention. It overwhelms other important areas of the composition–such as the tree and the line of benches.

Too little exposure

This print looks weak and washed out because it didn't get enough exposure. It contains no rich blacks. Even the tree trunks are gray. Much of the snow area has gone completely white; the feeling of texture is lost. The highlight on the walk has lost its importance as a picture element because it is just one more white area in a picture that is predominantly white. The photograph lacks depth and solid form because of this absence of middle tones.

Correct exposure

This print has been exposed correctly–it is neither too dark nor too light overall. The values look normal–the way you would expect to see them if you were actually looking at the subject. This snow scene has some strong black in the trees and bushes at top left. The two figures are dark, but contain some detail. And the snow itself, even though very light in tone, as we naturally expect it to be, contains gradations in value that reveal its texture. The only area of pure white is the brilliant highlight where the sun hits the wet sidewalk behind the two women.

2 Paper grade controls contrast

If you have a negative which is very contrasty or one that is very flat, it is still possible to make a contact print from it with a satisfactory range and gradation of tones. Contact papers come in different *grades* that provide varying degrees of contrast to help compensate for too much or too little contrast in the negative. Each of these grades has a number. The higher the number, the greater the contrast. Nos. 0 and 1 are low in contrast, and generally you'll use them when a negative has too much contrast. A negative with normal contrast usually prints well on a No. 2 or No. 3 paper. Grades No. 4 and No. 5 give increasingly higher contrast, and as a rule, you'll use them for printing low-contrast negatives.

Most of your negatives should print on a No. 2 or No. 3 paper, but you may also want to keep on hand small quantities of No. 1 and No. 4 for negatives not of normal contrast.

Study the three prints reproduced below to see how different paper grades can produce different results from the same negative. In each case, the *exposure* was adjusted to give a print of normal brightness. The changes you see were created by changes in paper grade only.

Too much contrast

A No. 4 grade of paper produced a print with too much contrast. The picture contains strong blacks [but without details] in the two women and the trees. It contains bright whites [with little detail] in the snow and the sidewalk reflection. It lacks the subtle tonal gradations needed to bring out the texture in the snow and enhance the feeling of depth. To give a fuller range of tones, this negative should be printed on a less contrasty [lower number] grade of paper.

Not enough contrast

A No. 1 grade of paper produced a print that is too flat–lacking in contrast. It contains texture and detail in the snow and in the two figures, but rather than having wide extremes of tone, from white to pure black, the picture is composed almost completely of tones of gray. Notice that what was white in the contrasty print is light gray here, and that what was black is now dark gray. The result, with this particular negative, is a dull and lifeless print. To give the picture more snap and brilliance, this negative should be printed on a higher contrast [higher number] paper.

Correct contrast

A No. 2 paper gave the proper amount of contrast with this negative. Notice the wide range of tones, including white and black. The snow now has the texture and detail that it lacked in the high-contrast print, but is not overly gray and muddy looking as in the low-contrast print.

The uses of contact prints

Contact prints can provide you with a relatively quick, easy, and inexpensive way to "proof" your work, to show a preliminary selection of pictures to client or customer, and to file a complete record of your shooting.

For these helpful "proofing" and filing purposes, you need a good print, but not necessarily one of finished quality. Instead of printing each negative frame separately, you can save time, effort, and paper if you print a number of shots at one time. For instance, you can contact-print a full roll of 120 film–three strips of four 2 1/4 x 2 1/4 frames each–on one 8 x10 sheet of printing paper. A full 36-exposure roll of 35-mm film, cut into six strips of six frames each, also can be printed on one 8 x10 sheet, as can a 20-exposure roll cut into four strips of five frames each. In each case, you'll have a complete record of an entire roll of film conveniently printed on a single contact proof sheet.

A contact sheet can show you at a glance which pictures contain serious technical errors–overexposure, underexposure, double exposures, faulty focusing, and so forth. From a creative standpoint, it can show whether or not you succeeded in getting the picture you wanted onto the film. If you took several shots of the same situation, your contact sheet can reveal which has the best composition, pose, or expression, and thus guide you in selecting the particular frames you want to enlarge.

A contact sheet is helpful when making the enlargement, too. By studying a contact of a negative you can decide whether to enlarge the entire picture–to print it "full frame," or whether the picture can be improved by "cropping"–printing only a portion of it. By looking at the contact sheet as well as the negative, an experienced photographer can get a clearer idea of the negative's contrast and density, and decide how to print it. This is referred to as "editing" your contacts.

When you go over your contact sheets, don't just look for your successful pictures–*also study the failures; try to see what you did wrong and how to correct it.* If a picture is bad because of a technical error, try to decide how you could have avoided it. If a composition is poor, think what you might have done to improve it when you shot the picture. Use your contact proof sheet not only as an indication of what pictures to print, but also as a teacher to show you how to improve your technique.

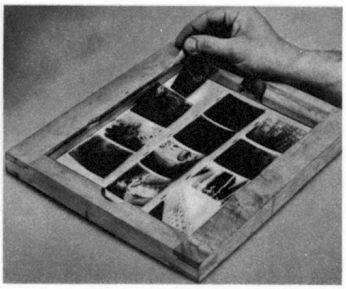
Contact sheets also provide the basic materials for a good filing system because the results of each roll you shoot will be on one sheet. If you contact-print every roll of film you shoot, you'll have a complete, convenient visual record of all your work. You can arrange the sheets so that you locate pictures you've shot previously in case you want to reprint them. Later on, if you receive professional assignments, contact sheets can provide a record of jobs done, and if a client reorders pictures, you'll know where to locate them. You'll gradually build up your personal "stock" of photographs, some of which may have continuing market value.

Numbering each contact proof sheet consecutively is a simple but effective system. Also mark this number on the glassine envelope in which the corresponding negative is to be kept. Attach this envelope to the back of the contact sheet, punch holes in the sheet, and put it in a loose-leaf ring binder.

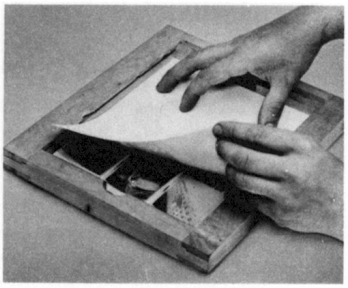
Any time you pick a shot from the contacts, the corresponding negative is right with it, and both contact sheet and envelope can be removed from the binder and taken to your darkroom.

Later in the Course, we'll show you more elaborate filing systems for special professional needs. But right now we recommend you set up a simple system such as the one described.

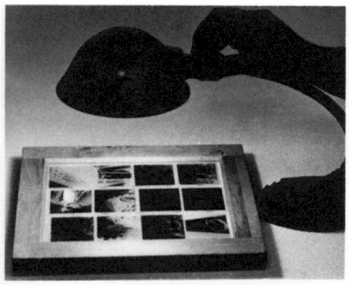
How to make an 8 x10 contact proof sheet



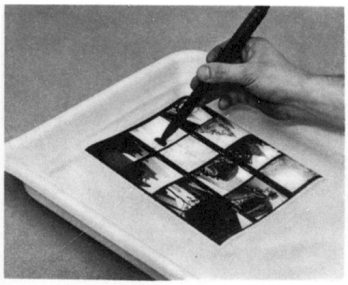
1 Position the negative strips: Place your printing frame with the glass side down and remove [or open] the back. Dust the film with your brush. Always be sure to handle the film by its edges only to avoid getting finger marks on it. Place your strips of negatives [emulsion side *up*] in rows on the glass as shown in the illustration above.



2 Position the printing paper: Next, *turn on your safelight and turn off the room lights.* Take a sheet of 8 x10 contact printing paper and place it emulsion side *down* on top of the negatives. Remember–the paper emulsion should always face the negative emulsion when you're printing. Close or replace the back of the printing frame.

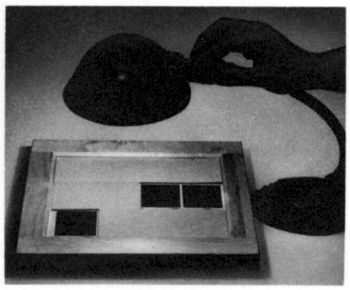


3 Make the printing exposure: Now turn the frame over so the glass side is up. Check to see that the strips of negatives are straight and not overlapping each other. Now expose the paper to light. Make sure your light source casts *even* illumination over the entire sheet of paper so you'll get an evenly exposed print.

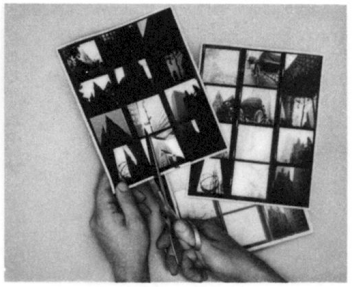


4 Process the print: Next, process in the usual way, following the same step-by-step procedure given for developing a contact print from a single negative. When you look at the finished contact sheet you may find some of the frames are too dark and some too light because of exposure variations. To correct, follow either procedure explained below.

Two ways to correct unevenly exposed rolls

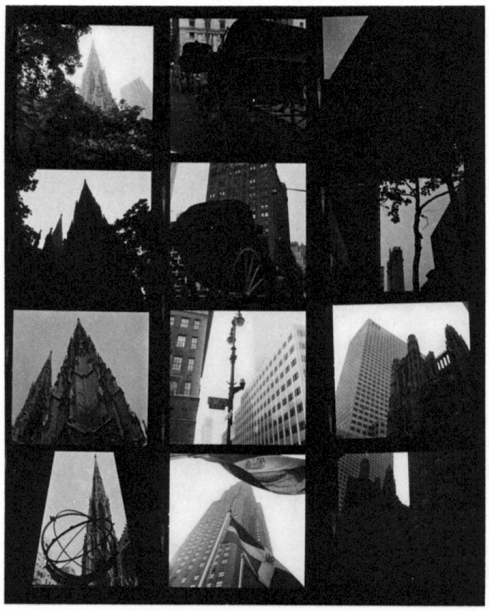


1 Mask individual negative frames: If individual negative frames on a roll are too light [thin], "mask" them so that they get less exposure than denser frames. Do this by covering the thinner negatives with cardboard after these frames have received enough exposure. Turn off the printing-exposure light while you place the cardboard over the adequately exposed frames. Then, turn on the exposure light again to allow more light to pass through the denser negatives. Group strips of approximately equal density together. Cover individual negatives with a cardboard the size of the frame.



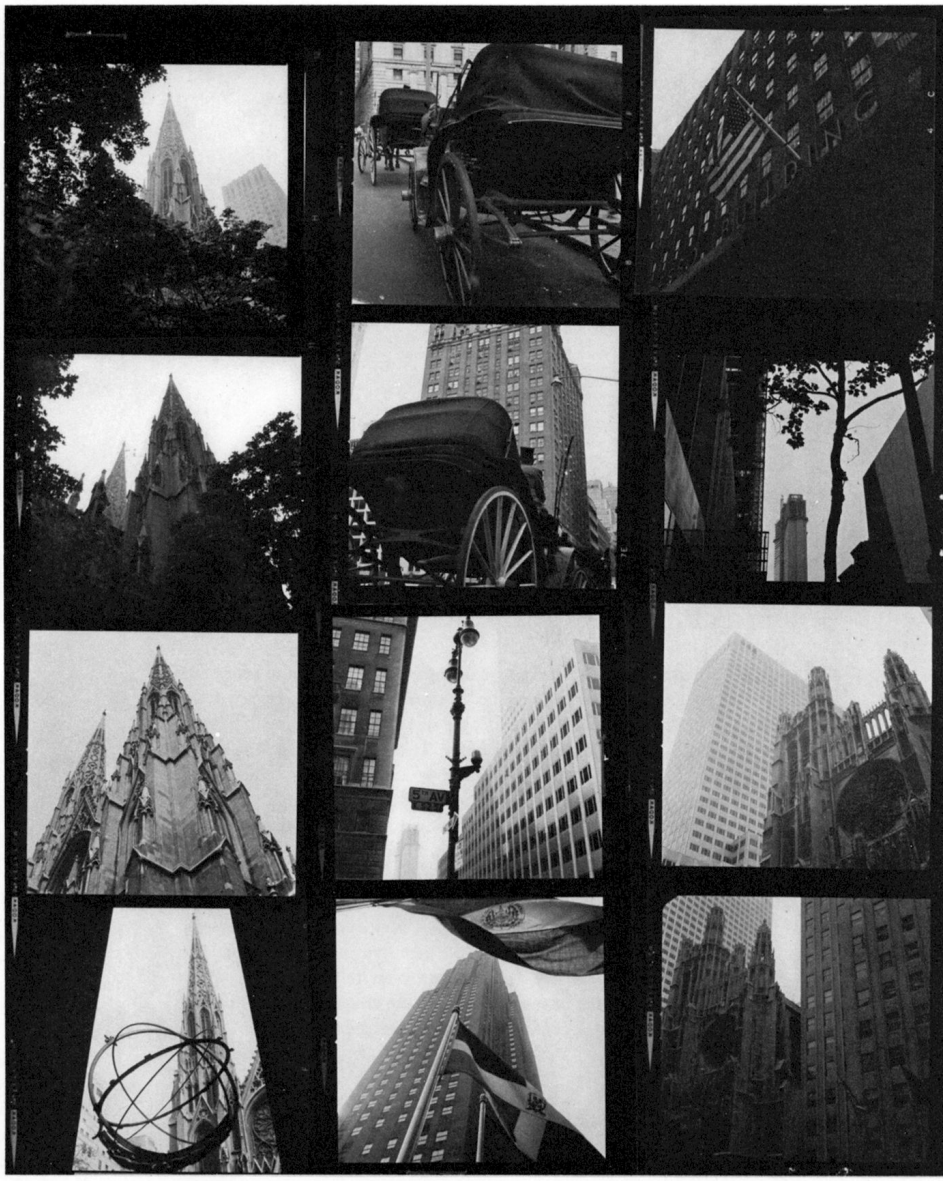
2 Make differently exposed sheets: Another way to correct unevenly exposed rolls is to make two or three separate 8 x10 contact sheets–one "master" sheet exposed for the normal negatives, and one each for dense and thin negatives. Then, as shown here, cut out the properly exposed frames from the last two sheets and with rubber cement, staples, or transparent tape, put them over the improperly exposed frames on your normal "master" sheet. This method may be more convenient than handling individual strips of cardboard as in the masking method.

Master sheet–exposure here was for the majority of negative frames having normal density. However, the print from the thin negative [*top right*] is too dark and the two bottom negative frames of the center strip and the top frame of the left-hand strip print too light. These need correction.



Sheet exposed for three dense frames–this 8x10 sheet received more exposure than did the master in order to properly print the overly dense negatives.

Sheet exposed for the thin frame–this 8 x10 sheet received less exposure than the master sheet to correctly print the one thin frame at top right.



This is what a corrected contact sheet looks like

At left are three separate contact sheets made from the same unevenly exposed roll of 120 film–the "master" sheet [*top*] exposed for the majority of negative frames having normal density, a sheet exposed for three overly dense frames, and a sheet exposed for a thin negative frame. Above is the corrected master sheet with the best frames from the other two sheets attached over the incorrectly exposed frames on the master. A similar effect could have been achieved on the master sheet by [1] exposing overall for the thin frame, [2] masking the thin frame and exposing for the normal frames, and [3] masking the normal frames and giving additional exposure for the dense frames. Although you don't need perfect print quality on a contact sheet used for proofing and filing, all frames should be clear enough to be easily viewed and evaluated.

Making enlargements

After you have thoroughly mastered contact printing, you're ready for the next step–making enlargements. In professional photography today the enlarged print *is* the picture. It's the end product that you deliver to your client, and your ability as a photographer will be judged by the client's reaction to it. Moreover, enlarging can be a highly creative step. It permits you to exercise important controls so that the finished picture is as close as possible to the idea you had in mind when you pressed the shutter. Therefore, you should know how to make high-quality enlargements so you can display your work to its best advantage.

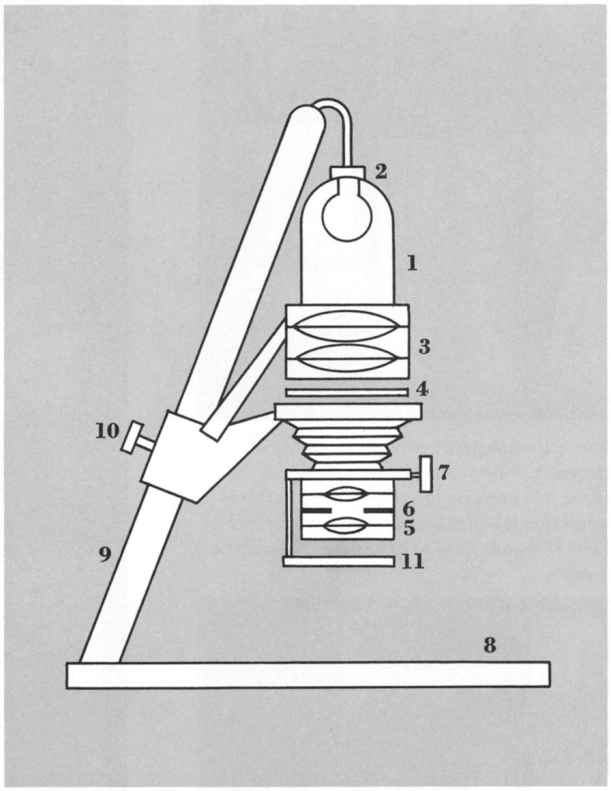
Many of the basic principles of contact printing also apply to enlarging. The essential difference is that a device called an *enlarger* is used to project a *magnified* image of the negative onto printing paper. Just as with contact printing, exposure forms an invisible image on the light-sensitive emulsion of the paper. Then the image is made visible by the same developing procedure used for contact prints.

The enlarger

If you seriously intend to become a professional photographer, an enlarger is second in importance only to your camera. If you don't already own an enlarger we feel you should get one early in this Course. If possible, first gain some experience actually making enlargements–perhaps on equipment available in a camera-club darkroom or from a friend. After you've gone through the procedure a few times you'll be in a better position to make intelligent decisions about the features and characteristics you like in an enlarger. Then do some comparison shopping. Look at used equipment, too. If cost is a problem, you often can get more value for your money by buying a used enlarger in good condition rather than a brand-new model.

Some enlargers only work with 35-mm negatives; others, which generally are larger and more expensive, take a variety of negative sizes. In choosing an enlarger, be sure you get one which will take the negative sizes you'll be using now and in the foreseeable future. For example, it might be a good idea to buy an enlarger that handles negative sizes from 35 mm up to 4x5 sheet film even if you're not using all these film sizes now.

A good enlarger–with smooth-working, accurate parts and a sharp lens–is a pleasure to use and it will help you get the most out of your negatives. A poor enlarger can be a source of irritation and frustration. So choose with care and buy the most quality you can afford.



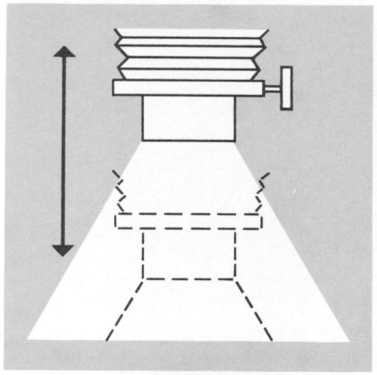
The anatomy of an enlarger

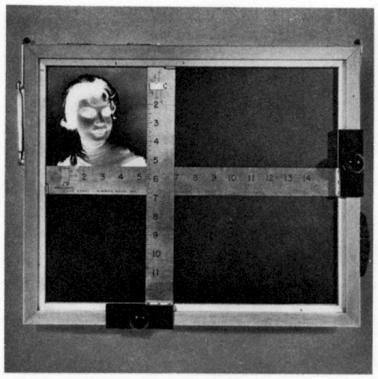
Before learning the step-by-step procedure for making enlargements, let's take a closer look at the equipment itself. Certain parts and controls are basic to almost all enlargers, regardless of differences in design and construction. The diagram above shows these important features in a cutaway view.

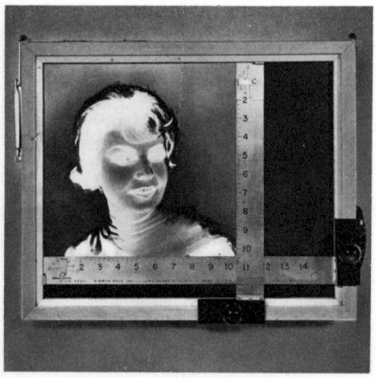
1 Lamp housing. A metal unit which encloses the light source.
2 Light source. Usually a removable, frosted tungsten bulb. On some models it may be a fluorescent tube or other "cold light" source.
3 Condensers. Large lenses used to concentrate the rays of light passing from the lamp housing to the negative. [Not all enlargers have condensers.]
4 Removable negative carrier. You take this out to insert the negative you want to print, then replace it in the enlarger.
5 Lens. Focuses the light rays, after they pass through the negative, to project a magnified image onto the photographic paper.
6 Adjustable iris diaphragm. Used to control the brightness of the projected image.
7 Focusing control. Used to focus the projected image. [These first seven parts make up the enlarging *head*.]
8 Baseboard. Provides a base for the entire enlarging unit, and holds the printing easel and paper upon which the image is projected.
9 Upright post or other rigid support. Holds the enlarging head in position above the baseboard. The head can be moved higher or lower on this support to give you greater or lesser magnification.
10 Locking device. Used to secure the head firmly in any position on the upright post.
11 Filter holder. Holds the various filters that are useful in enlarging. On more advanced equipment, the filter holder may be located above the condensers or directly above the lens.

Three basic controls in the enlarger–a head that can be raised or lowered, the focusing control, and the iris diaphragm–permit you to adjust the *size*, *sharpness*, and *brightness* of the negative's projected image. See the facing page for a detailed explanation of how these three important controls work.

Controlling the projected image



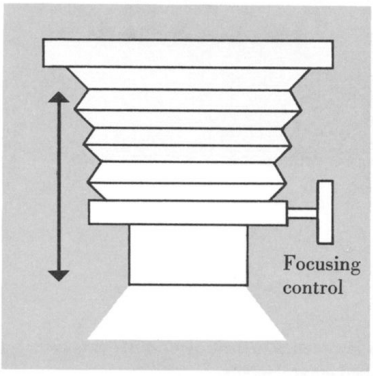




1 Image size

You control the size of the negative's projected image by raising or lowering the enlarger head as shown in the diagram. The lower the head, the less the magnification and the smaller the image, as in the center photograph. The higher the enlarger head is raised, the greater the magnification and the larger the image, as shown on the right.

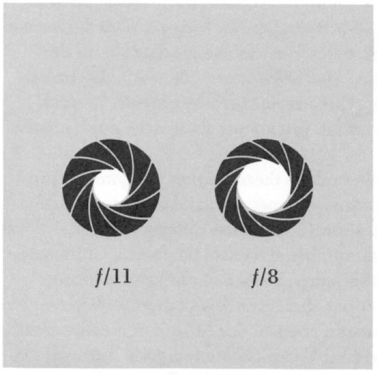
Once you have the enlarger head at the correct height for the image size you wish, lock it in place. Then use your focusing control to make the image absolutely sharp. This may change image size slightly. If the change is too great, raise or lower the head again to obtain exactly the image size you want, and then refocus.

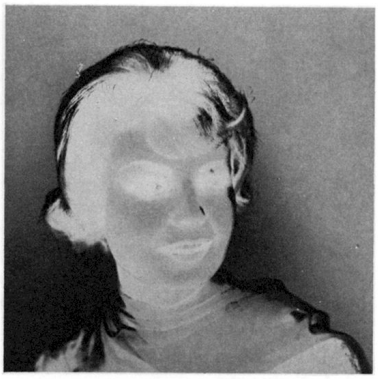


2 Image sharpness

No matter how sharp a picture you take with your camera, the print won't be sharp unless you use your focusing control [*left*] properly. Compare the incorrectly focused image [*center*] with the sharply focused image [*right*] projected from the same negative. The usual practice is to focus with the enlarger lens open to its widest aperture. This gives an image which is brighter and easier to see, and it allows a finer adjustment of the focusing control.

Many professionals use a device called an enlarging aid which magnifies a section of the projected image and permits focusing on the *grain pattern of the negative.* When you see the grain clearly, the image is in sharpest focus. To use one of these magnifying aids, place it in the center of the easel directly under the lens, look through it, and turn the focusing control back and forth until you find the sharpest focus.

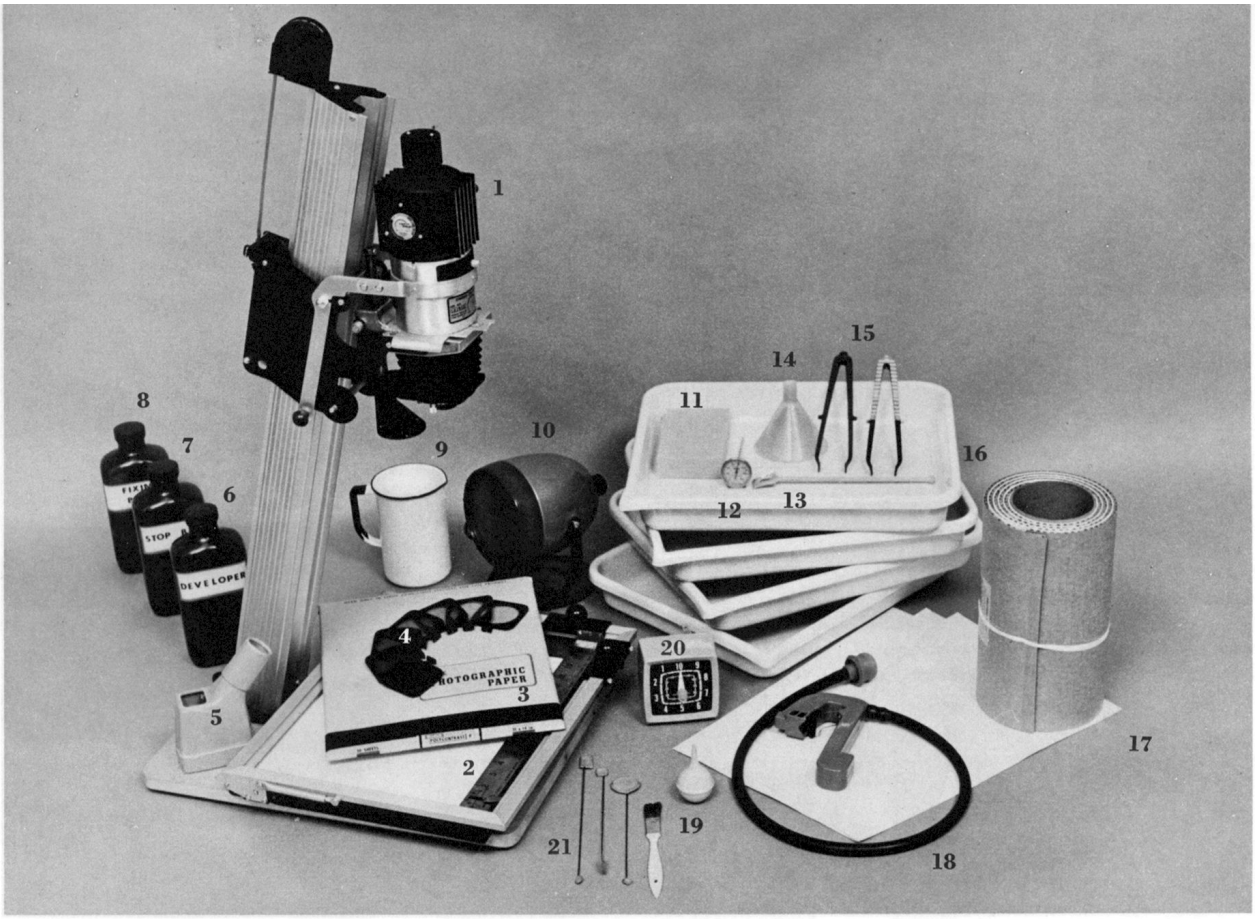




3 Image brightness

The iris diaphragm on your enlarging lens works on the same principle as the iris diaphragm on your camera lens. For example, opening up the lens a full stop, from *f*/11 to *f*/8 as shown, doubles the amount of light passing through the lens on its way to the paper. Compare the dark image [*center*] projected with the enlarger lens stopped down, with the bright image [*right*] projected with the lens at a wider aperture.

Although focusing usually is done with the lens wide open, it's wise to stop down one or two stops before making the exposure. This takes care of minor focusing errors, and usually gives you a sharp image despite slight waviness of the paper or buckling of the negative. You may want to stop down the lens even more than one or two stops, as explained later in this lesson.



Here's what you need for enlarging

Now that you're acquainted with the basic controls of the enlarger, the next step is to see what equipment and materials you'll require to make your enlargements. The things you need are shown in the photograph and are described below [with corresponding numbers].

1 An enlarger.

2 An enlarging easel. This piece of equipment holds your paper flat and allows you to adjust the margins. The easel sits on the baseboard of the enlarger. Be sure to purchase one large enough to take at least 11 x 14 sheets of paper. We recommend the type with *adjustable* arms, which gives you freedom in cropping your prints.

3 A box of 8 x 10 or 11 x 14 enlarging paper. We'll discuss paper later on this page.

4 A set of contrast-control filters. These are also discussed later.

5 A magnifying focusing aid. This is for more precise focusing and allows you to focus on the grain pattern of the negative.

You'll also need the following items, many of which you've already learned about in our discussion of contact printing:

6 Paper developer.

7 Stop bath.

8 Fixing bath.

9 A mixing graduate.

10 A safelight. *If you're printing on a variable-contrast paper, use a safelight with a suitable filter*—generally brownish or light amber. The yellow-green safelight often used with graded paper will not do, because a variable-contrast paper tends to fog in this light.

11 A fine-textured cellulose sponge.

12 A darkroom thermometer.

13 A stirring rod.

14 A glass or plastic funnel.

15 Two sets of tongs.

16 Four 11 x 14 trays.

17 A blotter or a blotter roll.

18 A hose and siphon which is attached to the tray or other container in which you wash your finished enlargements.

19 A sable brush and an ear syringe, used to brush and blow dust off negatives. [The syringe is available at most drugstores.]

20 A darkroom timer. For processing your enlargements, use the same one you use for contact printing. [A *printing timer*, which hooks up to your enlarger, is a useful additional accessory.]

21 Dodging tools. We'll explain how to use them later in this lesson.

Choosing your enlarging paper

Enlarging paper is similar to the contact printing paper you're already familiar with, but generally it is faster–more sensitive to light. There are two basic types available: papers graded in exactly the same manner as contact papers, and *variable-contrast papers*, which are supplied in a single grade approximately equivalent to No. 2 paper. With the second type, you vary the contrast by using filters to change the color of the light coming from the enlarger. One advantage of the variable-contrast papers is that you don't have to keep several grades of paper in stock. When you want to change contrast, you merely change the *filter*, not the paper being used.

Among professional photographers there are many arguments pro and con as to which is better–graded paper or variable-contrast paper. Different members of your Guiding Faculty use different papers, depending upon the particular quality and effect they want. Ultimately, the decision is up to the photographer, his personality and working methods. However, while you're a student in this Course, we believe you will find variable-contrast paper a good choice because it is convenient, flexible, and economical. See your Technical Manual for a listing of popular enlarging papers and their characteristics. The number of filters provided in a package and their designation vary with different brands of filters. Follow the manufacturer's directions for their use.

With these facts about enlarging paper in mind, you are ready to set up your materials for making enlargements.

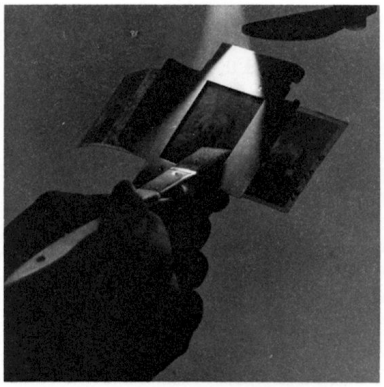
Setting up for enlarging

You need somewhat more room for enlarging than for contact printing. Though the "wet" operations are the same, the "dry" ones take up more space, mainly because the enlarger itself is sizeable and because it should be placed on a sturdy support to eliminate any vibration or shake. Nearby, or on the same surface, arrange an area for your negatives, paper, filters if you're using them, the timer, and tools for cleaning negatives.

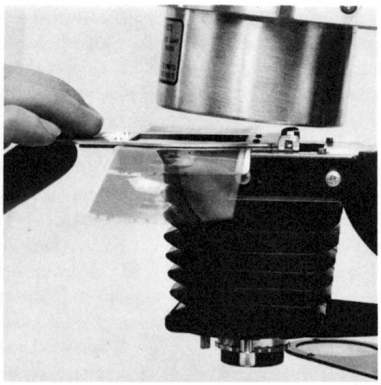
Set up your "wet" operations just as you did for contact printing, and make sure "wet" and "dry" operations are well separated. Before starting to print, check your darkroom for light leaks. This is important; enlarging papers are faster than contact papers and can be light struck or fogged more easily. If there are any small light leaks that might cause trouble, try patching them with black electrical tape.

Remember, too, that dust is the enemy of good enlargements. Both your workroom and your enlarger should be relatively free from dust before you set up. While printing, an air conditioner with an air filter helps keep the dust problem under control, besides keeping you and the solutions cool in warm weather. You may also want to add a radio for long printing sessions–many photographers do. [But be sure the light from the dial doesn't fog your paper.]

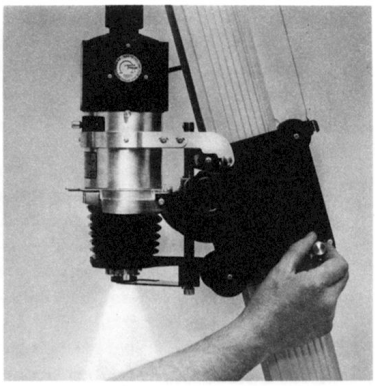
Follow these steps in enlarging



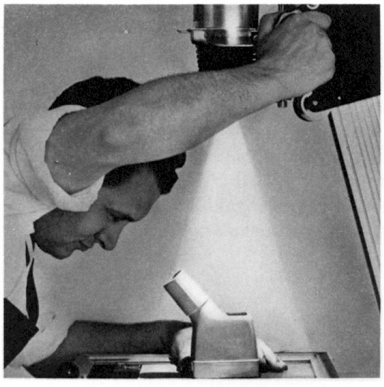
1 Clean your negative carefully: To make sure there is no dust on the negative, check it in good light, tilting the film in different directions. Blow off any dust specks with your syringe, then brush gently as shown. [With some enlargers, it's possible to inspect the film again after you've placed it in the negative carrier and inserted the carrier in the enlarger. Turn the enlarger light on for this second look.]



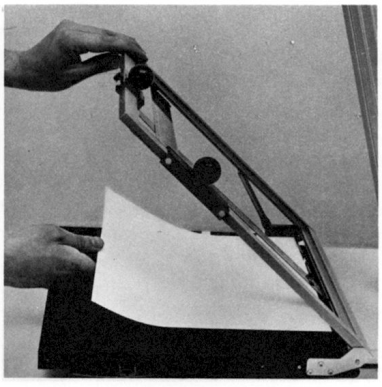
2 Insert film in negative carrier: Place the carrier in the enlarger. Be sure the film is *emulsion side down* and in strips as we recommended earlier. With horizontal shots, to get a right-side-up image on the easel, put the film into the carrier upside down–the top of the image on the film must be toward the edge of the carrier closest to you, as you insert it. Full-frame vertical shots are always inserted and projected in a sideways position. This usually is true with square roll-film shots, too.



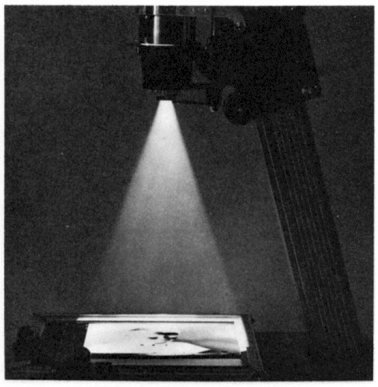
3 Adjust the enlarger head: Turn the room light off and the enlarger light on, so that you can clearly see the projected image. Move the enlarger head up and down until you get the proper image size, and lock the head in place. For reasons of economy, make your first enlargements on 8 x10 paper until you master the fundamentals. This means the easel arms should be set at about 7 1/2 inches for width and 9 1/2 inches for length, to allow a quarter-inch border all around. [Later on you can try 11x14 or even larger prints.]



4 Focus the image: You should do your focusing with the lens wide open and a sheet of blank enlarging paper in the easel. As we recommended, put a magnifying focusing aid in the center of the easel, and focus on the grain.



5 Insert the paper: Before inserting the sheet of enlarging paper, be sure to turn off your enlarger, stop down the lens, and remove the blank "target" sheet you used for focusing.



6 Make the exposure: To regulate exposure time, you can learn to count seconds fairly accurately. One system is to say, "A thousand and one, a thousand and two, a thousand and three," and so on as evenly as possible. A better method is to get a special timer which can be hooked into your enlarger and which automatically turns it off after a preset time elapses. Process the exposed print according to the manufacturer's directions included with the paper and developer.

How to make printing-exposure tests

After you've acquired some experience printing, you should be able to look at a negative and make a fairly accurate estimate of how much you need to expose it to produce a good print with your particular enlarger, paper, developer, and working methods.

However, to determine more exactly the exposure required, most photographers prefer to make a test print before attempting a final print.

To get the most information from your test, you can put more than one exposure on the same piece of printing paper and see which gives the best results.

First, examine your negative and estimate how much time you think it needs. Let's say that from past experience you decide an exposure of about six seconds should be approximately correct. Since this may be too low or too high, a logical procedure is to expose your test print in three sections, giving one section your estimated six-second exposure, one section less exposure–say three seconds, and one section more exposure–say nine seconds.

Place the negative in your enlarger and make all the necessary adjustments [raising the enlarger head, moving the easel, focusing, etc.] in preparation for making the print. If, after making the exposure, you decide to raise or lower the enlarger head, this will change the exposure for the next print. Raising the enlarger head increases the distance between the enlarger light source and the printing paper. It gives you greater magnification of the negative's projected image, but also produces a less intense image and therefore requires longer printing-exposure time. Lowering the enlarger head, of course, gives the opposite effect–it reduces image magnification but produces a brighter image, and therefore requires a reduction in printing-exposure time.

Thus, before making your test, be sure you have the image size exactly as you want it in your finished print.

Another important point–be sure to stop down the enlarger lens your customary two or three stops after focusing with the lens wide open.

Now, with the enlarger light off, and only the safelight on, place a sheet of printing paper in the easel.

Expose the entire piece of paper for the *shortest* time you are testing–in this example, three seconds. Make a mental note of each exposure time–or jot it down so you won't forget.

Next, cover one third of the paper. The sheet of cardboard stiffener that comes in a package of paper or a shirt cardboard makes a good covering for this purpose. Make a second exposure for the same length of time as the first–three seconds, in this case. Thus the uncovered two thirds of the print has received a total exposure of six seconds.

Now move the cardboard again until it leaves only one third of the paper uncovered. Make another three-second exposure. This third of the printing paper has received a total exposure of nine seconds.

Finally, process the print and examine it by white room light after it's properly fixed, and see which exposure produced the best result.

If none of the sections looks correct, pick the exposure that comes closest and make another multiple-exposure test print based on your new estimate.

In this example we used three test exposures at three-second intervals, but of course you can use the same method with different time intervals. Also, you can put more than three exposures on a print if you wish.

For instance, let's say you estimate the correct time to be 20 seconds, and you decide to test exposures of 10, 15, 20, 25, and 30 seconds. Your first overall exposure would be for ten seconds, and each subsequent exposure for five seconds as you progressively covered up the test print.

When you become more skilled in estimating exposure, you may find that you can economize on paper by making multiple-exposure tests on a *strip* of printing paper rather than using the entire sheet. Don't make such strips too narrow or they won't show enough detail. [Many photographers cut a sheet of enlarging paper lengthwise into two or three strips for testing purposes.]

Be sure to place the strip so that it will include the most important details in the picture–a person's face, for instance, in a portrait. Try to position the test strip so it will record a dark area, a light area, and a middle tone. Then you will have a more helpful guide to best exposure. With a vertical picture, place the test strip so it runs vertically–from top to bottom. When you make your test exposures, progressively cover the strip from side to side so that you'll have exposure sections that run the length of the strip. This usually gives a better variety of detail and values for comparison. With a horizontal picture, of course, place the strip so it runs from side to side and progressively expose the strip from bottom to top.

Primarily, you make a test strip or print to find the correct printing exposure. But it can also tell you something about contrast, too. If the test looks too contrasty or too flat, make a second test on a different contrast grade of paper or with a different variable-contrast filter.

Be sure to fix the test print or strip and examine it by *white light.* Until you've had considerable darkroom experience, it's difficult to judge print brightness or contrast by safelight illumination. Also keep in mind that a print tends to lose some contrast as it dries.

A typical printing-exposure test print

This test print first was given an overall exposure of three seconds. Then the right-hand third was covered by a sheet of cardboard and another three-second exposure was given. Thus the uncovered two thirds received a total exposure of six seconds. Finally, the cardboard was moved to cover the two thirds on the right and an additional three-second exposure was given. Thus the vertical strip on the left received a total of nine seconds exposure. Below we show you the kind of print that each of these exposures would produce.

nine-second exposure six-second exposure three-second exposure

A nine-second exposure would produce a full print that looks like this. It is too dark, and the shadows on the little girl's face lack detail.

The six-second exposure is about correct. When used for the final print it produced this result–a print that is neither too dark nor too light and that looks natural.

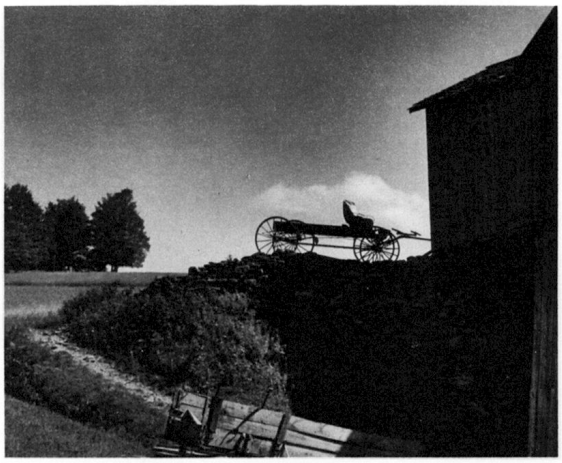
A three-second exposure would produce a full print that looks like this. It is too light overall, and looks weak and washed out, without adequate details in the sunlit concrete and the white towel.

Faults in printing and how to correct them

Here are some of the things that can go wrong when you're making enlargements. As you go over your first prints, refer to this list. Compare your results with the photographs reproduced here. If any of these faults appear in your prints, make the enlargement over again, following the suggestions given below.

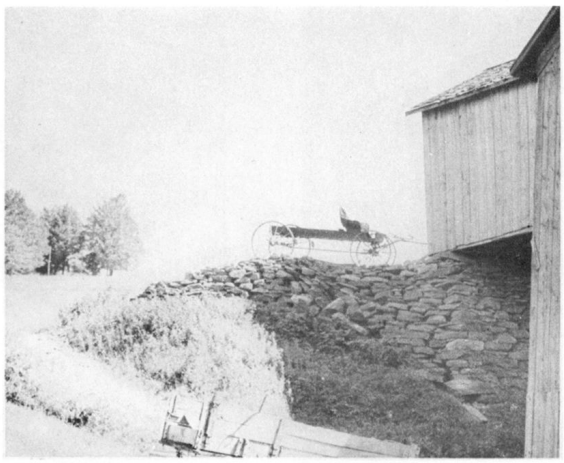
Good print

This is shown for comparison purposes. Notice that the whites [as in the clouds] are clean, and detail is maintained in the large shadow area without sacrificing the rich blacks. None of the six common faults illustrated here shows up, because the photographer took basic precautions and followed directions carefully.



Overexposed print

This is too dark. It has lost detail in the shadows. If your print looks like this, go back and make another enlargement, using a *shorter* exposure time. If each time you make a print you write lightly in pencil on the back the exposure time, enlarger lens setting, paper grade or filter used [do this *before* you develop], you'll have a helpful reference in case you must make corrections later. Remember–if you change magnification between prints, you also change exposure.



Underexposed print

This is too light because the paper received too little exposure. The sky has washed out completely and there is very little texture in other light areas of the print. To avoid this problem, give more time on the next print. If you're not sure how much more to give, make a test strip before exposing a whole sheet of paper.

Flat because pulled too fast

Here the photographer overexposed and then tried to save the day by yanking the print out of the developer before developing time was complete. The result is a gray, flat print, without depth or richness. Make it a general rule to leave your prints in the developer the *full developing time*. If the print is too dark, make another print, reducing exposure time. [You shouldn't leave a print in the developer longer than the 1 1/2 to 2 minutes usually recommended for enlarging papers. The result can be a "muddy" print with grayed-over light areas.]

Dust spots

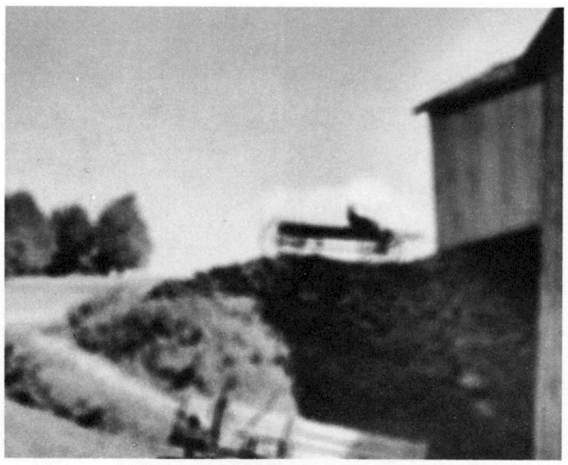
If you find white marks like these on your print, there was dust on the negative during exposure. These spots on the print can be filled in with spotting colors, as we'll explain later in this lesson. But this is a time-consuming job, and if there are many spots you'll probably find it simpler to clean the negative again and make a fresh print. The usual cause of dust on the negative is a dusty darkroom and/or dust on the enlarger. It's a good idea to vacuum your enlarger occasionally, using one of the small attachments on your vacuum cleaner to remove dust from the inside and hard-to-reach corners. Periodic vacuuming of your work area also is a good precaution.

Stains

Stains can come from a number of different causes: worn-out developer or fixer, overused stop bath, and insufficient fixing or washing. The best way to avoid stains is to follow the manufacturer's directions and never run more prints through a solution than its recommended capacity.

A good motto about any of your chemical solutions is: "When in doubt, throw it out." Don't take chances with old chemicals or overly used solutions. The few pennies you try to save here may cost you much more in wasted paper and time. [Even if a worn-out developer doesn't stain, it can give you muddy, gray prints, lacking rich tones.]

Keep your developer-solution temperature down to normal, too–if it's too warm, prints can turn yellowish or brownish during processing. While fixing more than one print at a time, it's important to agitate sufficiently or the prints may stick together; this can cause yellow or brown stains.



Faulty focusing

This will result in pictures that are unsharp. Even a slight error in focusing can harm image quality. If your print isn't as sharp as it should be, check these points: Did you focus with the lens wide open, then stop down? Did you focus on the grain? If you consistently have trouble focusing, use a magnifying focusing aid, as already described.

Another possible cause of unsharpness in your prints is vibration of your enlarger during the exposure. Touching the enlarger during exposure can jar it; even walking around can shake the floor boards and transmit vibrations to the enlarger. The remedy is to place your enlarger on as secure a surface as possible and avoid moving around during the actual exposure.

Creative controls in printing

Printing is a flexible, creative process because of the various ways it allows you to control the final appearance of your picture. We have demonstrated how you can use printing *exposure* to make your prints lighter or darker overall, and how you can alter *contrast* by choice of paper or variable-contrast filter to give your prints more snap and brilliance or to produce a soft, gentle gradation of tones. Now we will introduce you to three more important creative controls–*cropping* [printing part of a negative] and *dodging* and *printing in* [to make selected areas of your print lighter or darker]. You should master these controls so you can make good prints in the technical sense–clear, sharp, not too dark or too light–and so you can make your prints communicate your picture ideas clearly and effectively.

Cropping

Using only a part of the image on the full negative is called *cropping*. In Lesson 3 you've already been shown many of the whys of cropping, and seen how members of your Guiding Faculty use cropping to strengthen and improve the composition of their pictures. Here we will show you how to accomplish this in the darkroom.

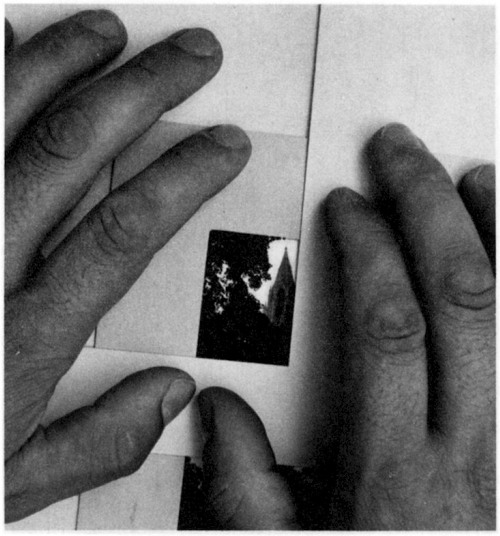
As a general rule, try to compose your pictures on the viewfinder as closely as possible to the way you want them to be in the final print. Sometimes, of course, the *proportions* of the viewfinder you're using will not be the same as the proportions you want in your enlargement. [For example, you may want to get a vertical or horizontal picture with a square-format 120 twin-lens reflex camera.] In this case, try to visualize the boundaries of the final print as you look into the viewfinder, and utilize as much of the viewfinder area within these boundaries as possible. Then crop the picture so that you get the proportions you need for your print.

There are other good reasons which may make it necessary or desirable for you to crop. You may want to crop to *improve the composition*. This kind of cropping can range from eliminating distracting details at the edges of the frame and straightening tilted horizon lines to changing the location of the center of interest within the frame and strengthening lines of direction. Of course, a disorganized, poorly composed picture can seldom be saved by corrective cropping. But sometimes minor adjustments will make a basically good composition even better.

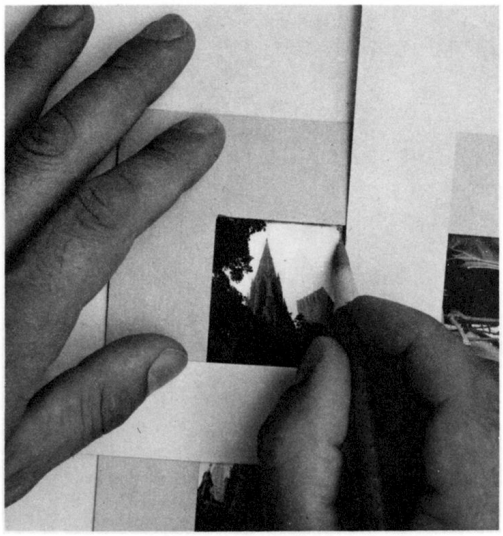
Cropping can also provide a *bigger image* of the subject. Sometimes, in shooting, it is impossible to get close enough or to use a lens with a long-enough focal length. By cropping, however, you can leave out the unnecessary detail and emphasize the essentials.

A final but comparatively rare use of cropping is for some specific *experimental* effect–such as emphasizing grain by greatly enlarging a small portion of a picture. We'll discuss this aspect of cropping in a more advanced lesson.

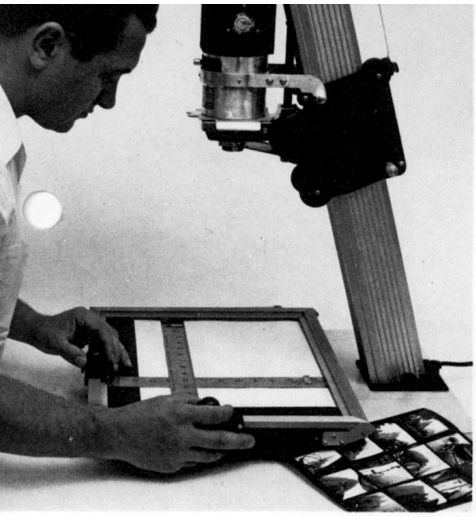
Cropping, step by step



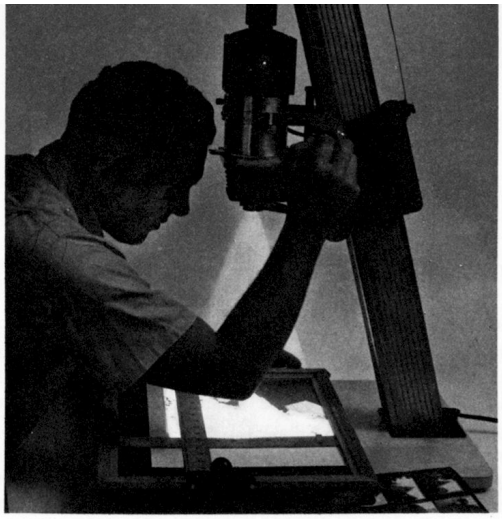
1 Experiment on your contact print: A contact print of the full negative is a great help in finding the most effective cropping for a picture. So is a pair of *cropping arms*, shown in use here. From an 8 x 10 piece of cardboard [such as the stiffener that comes with photographic paper], cut two right angles with a sharp razor blade. Use a T-square and triangle, or a ruler, to assure true right angles. Place both cropping arms over the contact print and move them around until you achieve the composition and proportion you want.



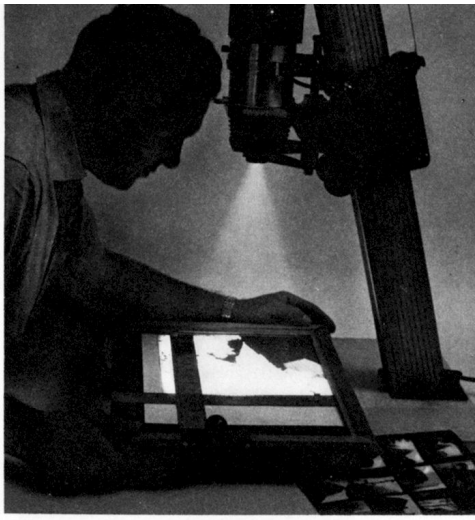
2 Mark the cropping: Hold the cropping arms firmly in place and mark your cropping on the print with a red grease pencil. Red grease pencil shows up clearly on a contact or other photographic print, yet can be easily removed with lighter fluid and cleansing tissue. Use the marked print as a guide for setting up the enlarger. Remember, you don't always need to fill up a complete sheet of printing paper–the picture may be more interesting as a square or as a narrow vertical or horizontal rectangle. Let the nature of the picture determine the cropping.



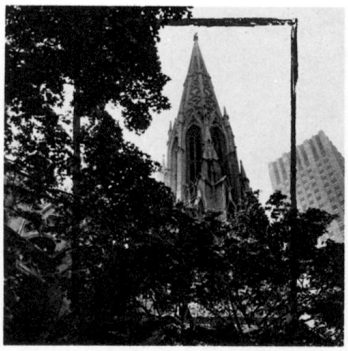
3 Adjust the easel arms: With your marked contact print as a guide, adjust your easel borders to the size and format of the paper. Leave a *minimum* of a quarter-inch margin on each side so the easel will cover enough of the paper to hold it flat.



4 Adjust the enlarger head: Turn off the room lights, turn on the enlarger light, and adjust the head of your enlarger to get approximately the right image size to fill the area inside the easel arms with that portion of the picture you've decided to print. Focus the image.

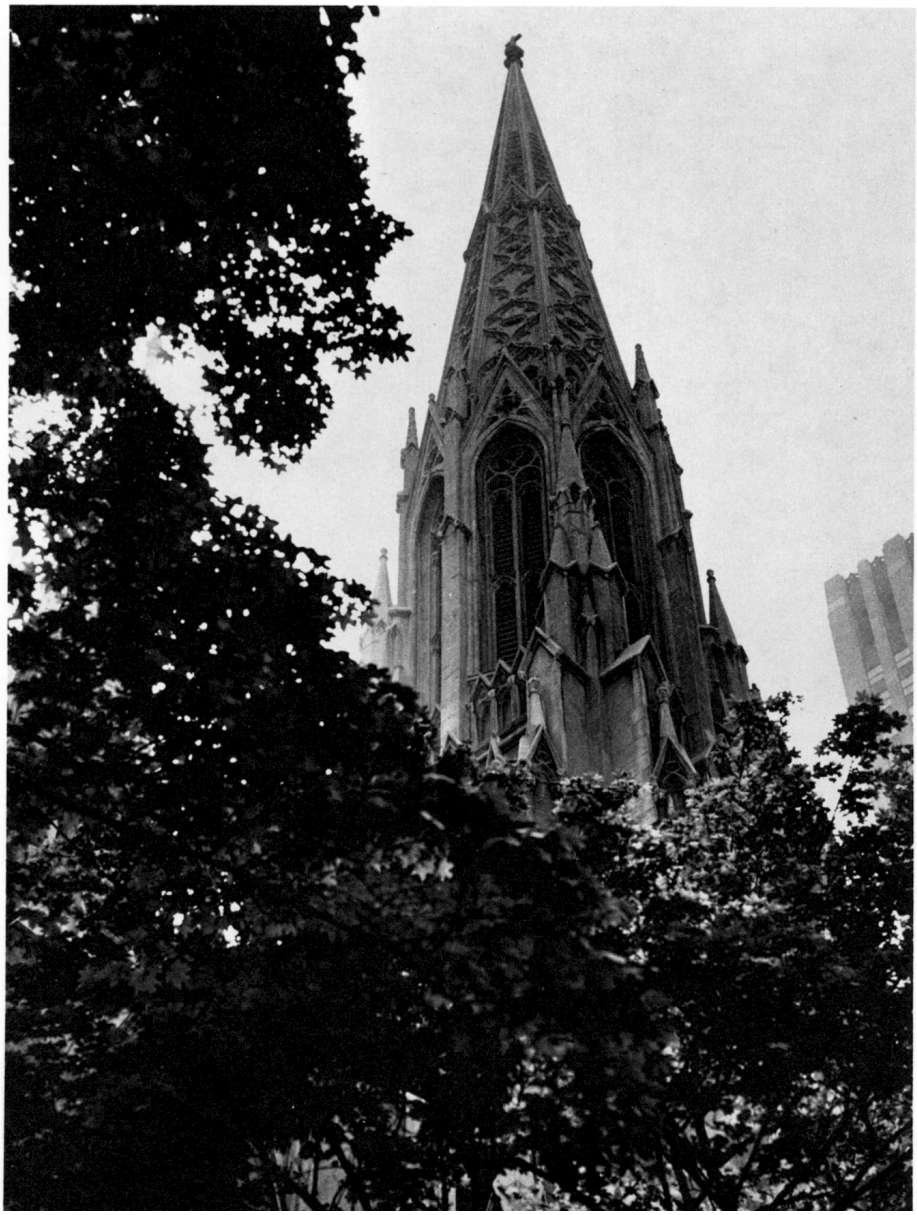


5 Make final adjustments: If necessary, move the easel itself and readjust the easel borders until the image is projected exactly as indicated on your marked contact print. Keep alternating between steps four and five until you achieve precisely the cropping you want. Then make sure the projected image is in sharpest possible focus and proceed to make an enlargement as shown in the previous step-by-step demonstration.

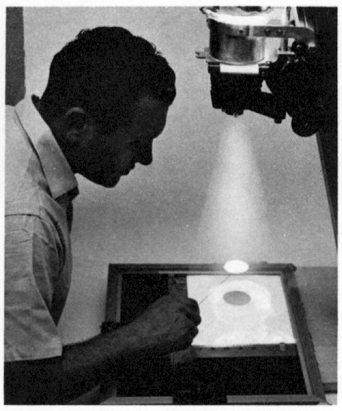


Contact print: Here's an uncropped, full-frame contact print of the subject of our demonstration, photographed on a 2 1/4 x 2 1/4 square frame of 120 roll film. We had two reasons for cropping–we wanted to give the picture a vertical shape which would emphasize the upward thrust of the church spire and we wanted to eliminate some of the surrounding foliage. The grease-pencil crop marks are visible on this print.

Enlargement: The enlargement of our contact print is shown at right. Notice that the leaves form a partial frame around the buildings, adding a feeling of depth to the photograph. The top of the modern skyscraper is included because it provides an interesting contrast with the ornate Gothic spire of the church.



Dodging



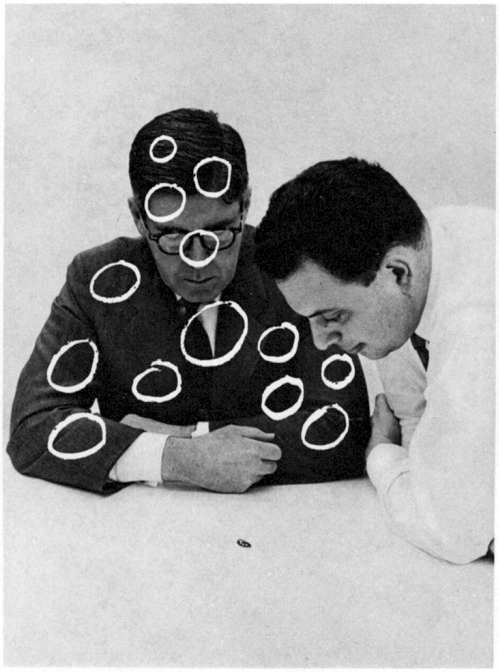
It is often possible to improve a print considerably by changing the tone of specific areas within it. You can do this by *holding back* light from such areas during the printing exposure to make them lighter, or by *adding more light* to make them darker. The first of these methods is called *dodging* and the second is called *printing in*. First we'll explain the technique of dodging–holding back light from specific areas.

In dodging, you place your hand, a piece of cardboard, or a specially made dodging tool [shown in the picture at left] between the lens and the projected image to throw a shadow on the particular area of the picture you want to make *lighter*. Because you hold back light from this area for a while, it gets less exposure than it otherwise would, and thus is lighter in the developed print.

Like cropping, dodging can be used both for creative and corrective purposes. A common use of dodging is to hold back shadow areas to keep them from going so dark that they lose all detail. For example, a girl's face may be too much in shadow, while the rest of the scene is brightly lighted. Or the foreground in the picture may be too dark for the background. In each case, holding light back during part of the exposure time gives these dark areas less exposure–while the overall exposure produces good detail in other areas.

The exact amount of time you will need to dodge [or to print in] can vary widely, depending on the picture. Even an experienced photographer may need to make one or more test prints in order to determine how much time to allow.

Here's a straight contact print of a photograph by Philippe Halsman showing two engineers examining a tiny electronics part. Halsman exposed the print so that the very light areas of the picture–such as the white shirt of the man on the right–would contain sufficient detail. However, the face and suit of the man facing the camera are too dark. Notice how the tie tends to merge with the suit, and that detail is lost in this area.



Here's the contact print marked in grease pencil with small circles–the accepted symbol for dodging–indicating the area that the photographer decided to hold back during exposure. During the printing exposure, Halsman used one dodging tool similar to the one shown on the facing page to hold back light from all these areas on the face and coat and thus prevent them from going too dark in the print.

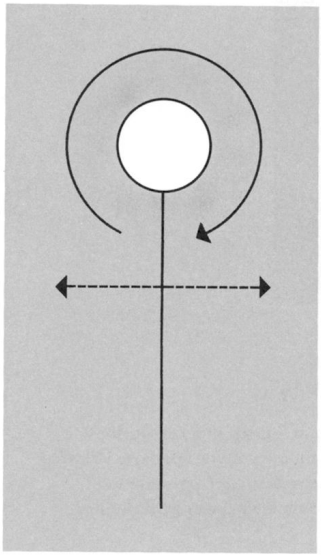
This is the corrected, dodged print. Notice that the face tones on the man wearing glasses are now lighter–they approximately match those of the other man. The suit is also lighter, with better detail and adequate separation between the tie and lapels. The print looks natural, without any sign that it has been manipulated during printing exposure.
[Courtesy Martin Marietta Corp.]

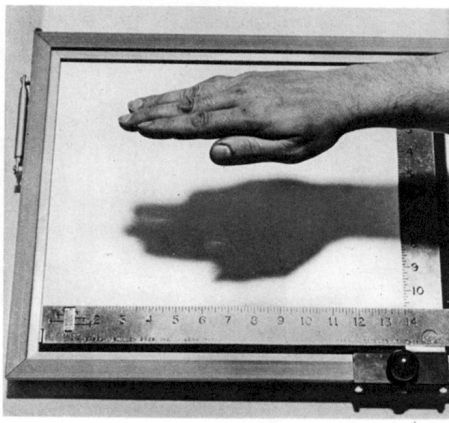
Tools for dodging

Your dodging tools can be as simple as your own hand, held under the lens of the enlarger. Many photographers prefer to use their hand or hands, finding that this method gives them greater freedom and flexibility in producing shadows of different shapes and sizes for dodging a variety of areas. However, others prefer to use a sheet of cardboard or other specially constructed dodging tools.

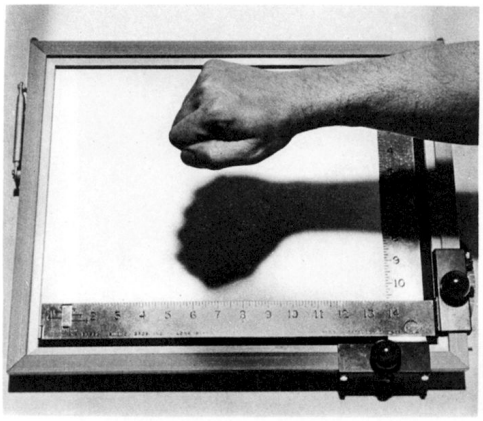
For the sake of clarity, we've shown hands and the dodging tool casting a shadow on the printing paper in pure white light rather than under an enlarger lens. The important thing to study in these demonstrations is the relationship of the hand or tool to the shape of the shadow it casts. The shadow generally should be slightly smaller than the area to be dodged, and of approximately the same shape. You can control the size of the shadow by raising or lowering your hand or tool.

It's essential to keep the dodging tool in constant motion during exposure time so that sharp, distinct shadow edges don't form on the print. Use a circular movement as indicated by the solid arrow in the diagram at right, or a sideways motion as indicated by the broken arrow. Sometimes these movements can be combined with a slight up-and-down motion. Keep the wire handle of the tool or your wrist and arm moving constantly so their cast shadow won't affect the print.

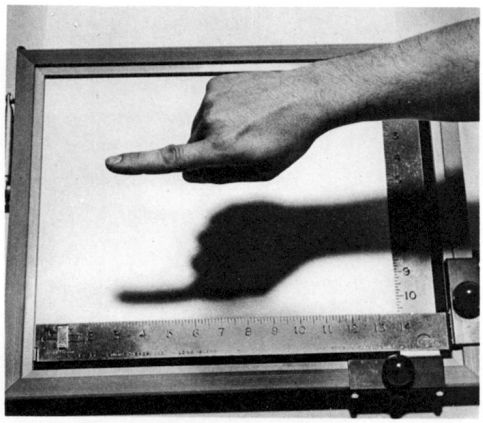




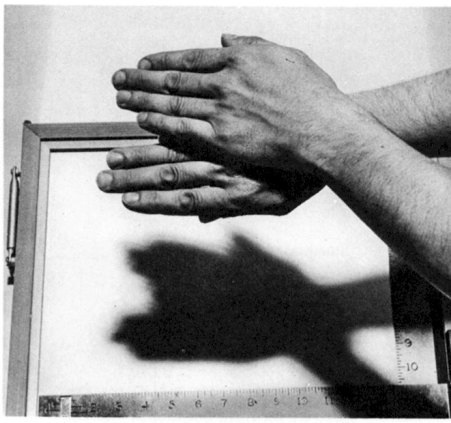
Open hand: This works well for many medium-sized areas, but not for very small ones. Raise or lower your hand until the shadow just fills the area to be dodged.



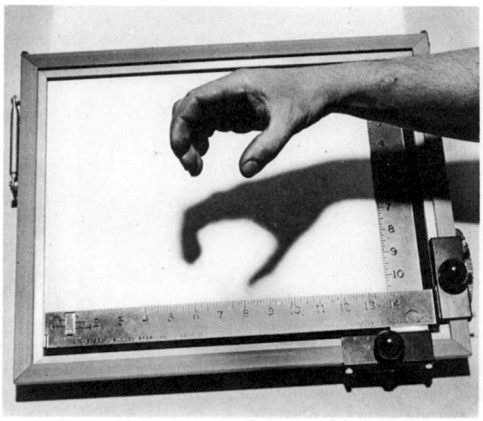
Fist: You can cover a somewhat smaller area by using your fist. Since the shape is rounder than your open hand, it may be more suitable for dodging some areas.



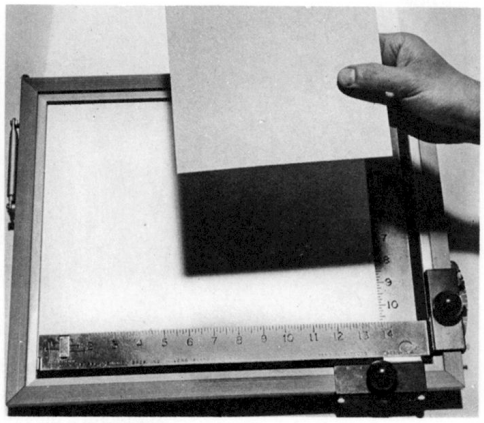
Finger: The narrow shadow cast by a finger can be useful for holding back light in small, narrow areas. If one finger doesn't give a wide enough shadow, use two fingers instead.



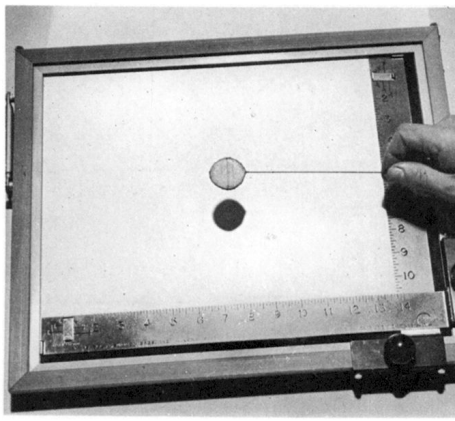
Two hands: Use two hands when you have a large area to dodge. You can hold them side by side to cast one big shadow on the paper, overlap them, or position them so the shadow is L-shaped, or some other shape.



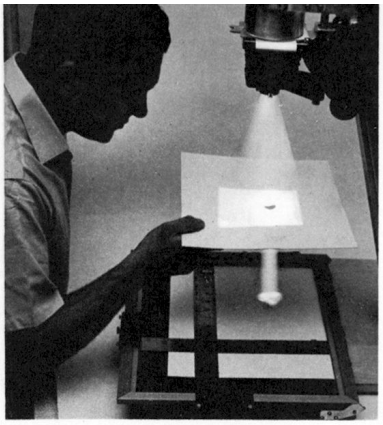
Shaped hand: Another alternative is to combine hand and fingers to form a shadow of a needed shape–here it's a crescent. Of course, you can work out many other shapes as required by the area to be dodged.



Cardboard: When dodging larger areas, some photographers prefer to use a piece of cardboard. The cardboard can be cut to any shape you need.



Special tools: You can also buy special dodging tools, or make them yourself from a wire hanger, cardboard, and some tape, as above. The tool shown is particularly handy for dodging small areas, and the wire handle will not affect the image if you keep it moving.



Printing in

Printing in–sometimes called "burning in"–is the other important control over the value of tones in a certain area of your picture. Printing in is just the reverse of dodging. You give *additional* exposure to a selected area or areas of the print to *darken* these areas while holding back light from the rest.

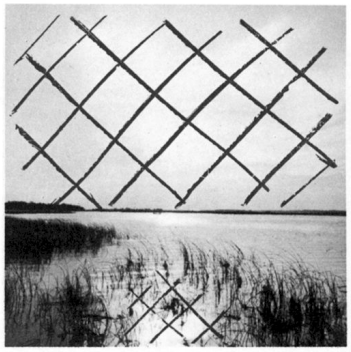
The printing-in tool is usually a piece of cardboard with a hole in it, or you can hold your two hands to form a hole. You position the hole between the lens and the paper so that light falls through it only on the part of the picture you want to darken. The rest of the projected image is blocked by your hand or the cardboard to keep it from reaching the printing paper in your easel. In the example illustrated at left, the photographer is printing in a small area in the center of the picture.

The usual procedure with printing in is to give the basic overall printing exposure first, then position the hole and expose again through it where necessary. Thus dodging is done *during* the basic overall exposure, and printing in is done *after*.

Areas that may need printing in are dense areas of the negative, which reproduce as pure white or very light gray on the picture. For example, a bright sky, a white shirt, or bright highlights on a face may require printing in to darken the values and bring out details.

You should keep the printing-in tool in constant motion, just as you do a dodging tool, to prevent clearly defined edges from forming. The printed-in area should blend imperceptibly into the rest of the picture. As with dodging, the test of skilled printing in is that it achieves its purpose without being noticeable.

Here's a straight contact print. The brightly lighted sunset sky and the sun's reflection in the water look too pale and washed out. They require more exposure than the surrounding darker areas.



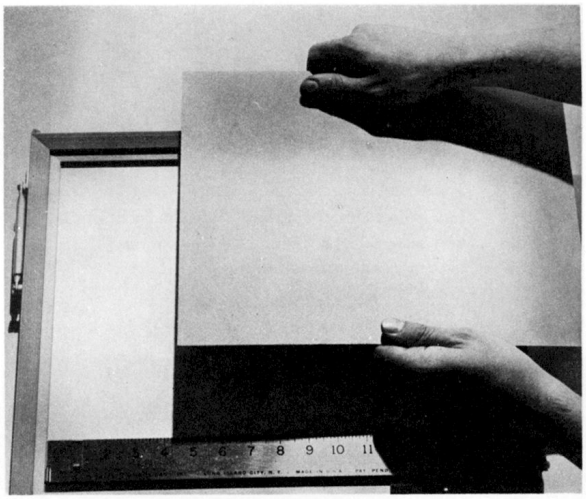
This is the same print marked to indicate the areas to be printed in. Generally, cross-hatching, as shown here, is used to indicate such areas if you are giving directions to a printer. Sometimes short, diagonal "slash" marks are used for convenience in filling large areas.

And here's the final print. First an overall exposure of 12 seconds was given. Then, with a sheet of cardboard blocking off the bottom part of the picture, the sky area was printed in for an additional 10 seconds. Next, a sheet of cardboard with a hole in it was used to print in the reflection of the sun for the same additional time. Notice that these areas now are stronger in tone and contain considerably more detail. [Photograph by Victor Keppler, courtesy Calvert Distillers Co.]

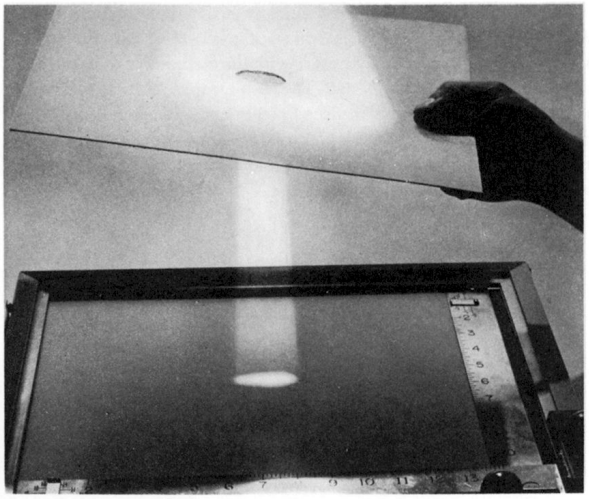
Tools for printing in

As with dodging, some photographers prefer to use their hands and arms for printing in, but many prefer to make their own simple tools. A shirt cardboard or the piece of cardboard stiffener that comes with photographic paper can easily be adapted to this purpose. The examples on this page show you some of the ways you can create different sizes and shapes to print in various kinds of areas, and a convenient, flexible method for using one or both of your hands in combination with a sheet of cardboard.

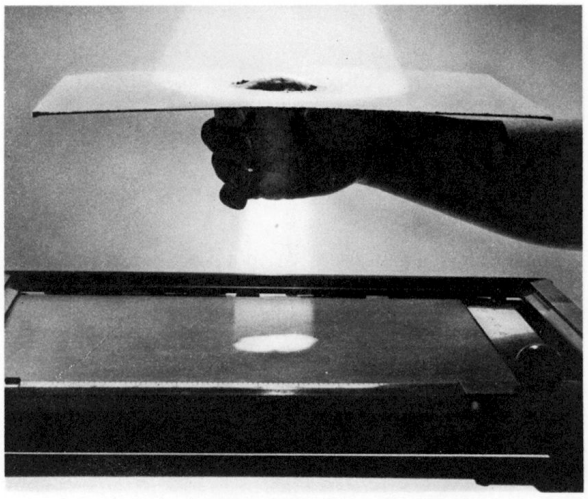
When printing in a very dense area that requires prolonged exposure, you can speed up the process by using your enlarger lens *wide open* for the printing-in process. However, remember to stop down again before you make another print.



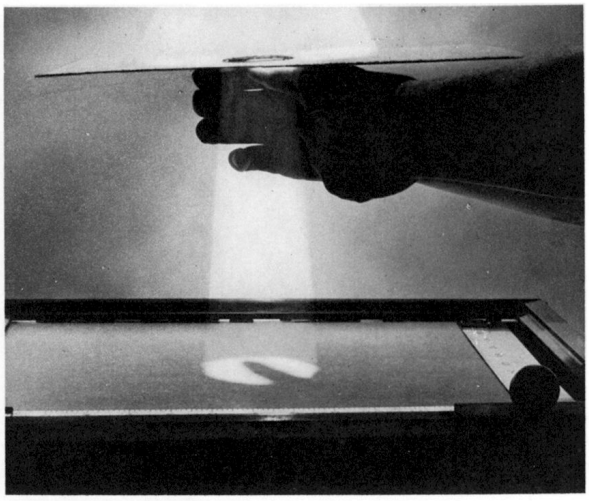
Plain cardboard: For large or fairly large areas you often can use a sheet of cardboard to block off light from all parts of the print except the area you want to print in, as shown here. Sky areas, in particular, often can be printed in easily by this method. Remember to keep the edge of the cardboard in constant motion.



Cardboard with hole: This is probably the most precise way to print in a small area. You can cut a hole to the exact shape and size required in a sheet of cardboard. Here the photographer is using a teardrop-shaped opening.



Combination hand and cardboard: For this method, cut a hole in the cardboard about the size of your cupped hand. Place your hand under the hole as shown. Now you can vary the size of the hole by opening and closing your hand to get the right shape. The cardboard resting on top of your hand blocks off light from the remaining areas of the print.



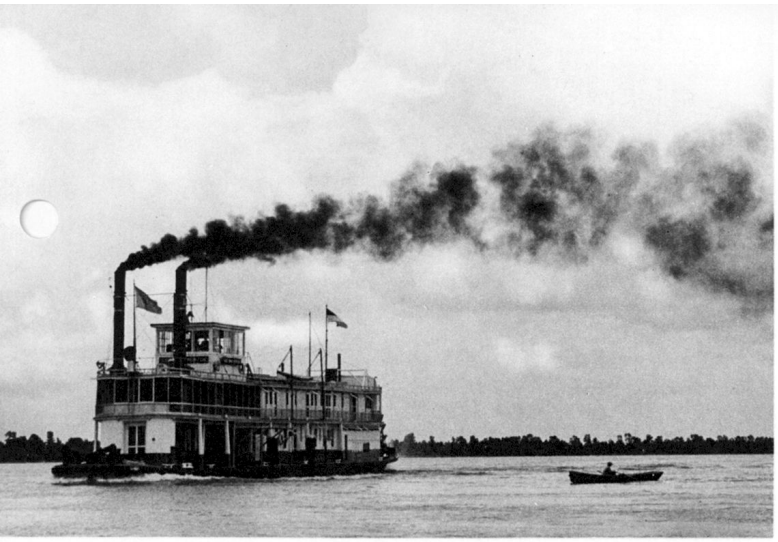
Two hands and cardboard: For odd-shaped areas, two hands and a piece of cardboard sometimes provide a good solution. Cup one hand under the hole to vary the size of it [as previously described], and use a finger or fingers of the other hand to form the shape you need.

Examples of dodging and printing in

There are times when you may be fortunate enough to begin with perfect or nearly perfect negatives which you can print "straight" and get exactly the gradation of tones you want in all areas. But often you're likely to need to alter an area or areas with the methods of dodging and printing in we have demonstrated. The photographs on these two pages show how members of your Guiding Faculty have changed the value of certain tones to strengthen their pictures. In each example, compare the straight contact print with the final print and see where–and why–the photographer chose to dodge or print in.

In a straight print of this photograph by Philippe Halsman of film actress Tippi Hedren, the shadows on the girl's face are too dark and require dodging.

To make the correct print, Halsman held back light from the face and hair by using a small circular dodging tool and giving these areas about 20 percent less exposure than the print received overall. In examining your own prints of people, be sure to study their flesh tones. It is very important to make flesh tones appear natural–neither too light nor too dark–since viewers tend to be very aware of these areas of tone.



In this straight print of a photograph of a Mississippi riverboat by Alfred Eisenstaedt, an important element is the sky. The negative contained considerable detail of clouds and smoke in the sky area, but these details have not come through fully in the print. Printing in is required. Also, for a really effective picture, the blacks should be richer throughout the photograph.

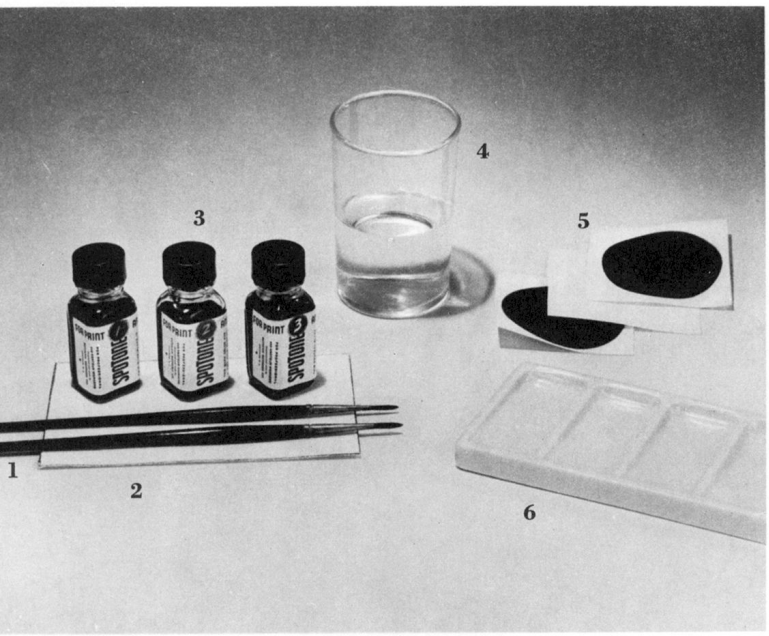
To produce this corrected print, Eisenstaedt began with a longer overall exposure than before, thus strengthening the blacks. Then he used a piece of cardboard to hold back light from the boat and river while he printed in the sky area for about 50 percent longer. This additional exposure added detail and texture to the clouds, which now contrast effectively with the black smoke pouring from the stacks of the steamboat. To give a frankly romantic interpretation of this subject, Eisenstaedt emphasized the clouds by making them even darker than they actually appeared in the scene.
[Courtesy *Life* magazine, ©Time, Inc.]

Spotting

As you look over your finished prints and enlargements carefully, you may notice a few white spots or fine white lines marring the total effect. White spots [like the ones shown in the photograph at bottom right] are caused by dust settling on the negative and remaining there during the printing exposure; it prevents light from passing through part of the negative, and results in white spots on the print. Some of the white lines–particularly very small ones–are caused by fine dust hairs on the negative, but larger white lines generally indicate the negative has been scratched. *Spotting* is a technique to help you disguise these flaws and give your pictures a clean, professional look.

We've already stressed the necessity of cleaning your negatives carefully and making sure both the enlarger and your workroom are as free from dust as possible. To keep white spots and lines to a minimum, it is important to follow those suggestions as well as two others: Handle negatives by the edges only, and keep them in protective glassine photographic envelopes when you're not actually using them. Even with all this care, however, it's still possible to get a few of these white spots or lines on your prints.

In spotting, you fill in the white spot or line with specially made dyes so that it matches the tone of the surrounding area. If the surrounding tone is light gray, you fill in the white area to match it; if dark gray, use a darker spotting color to correspond to the surrounding tone. Once you get the knack of applying the dyes, you can spot prints so the spotting won't show.



What you need for spotting

Here are the simple tools and materials you'll need to spot your prints. [They are shown, with corresponding numbers, in the photo.]

1 Two fine *pointed* sable brushes–a No. 1 and a No. 2.

2 A small sheet of white blotter. You use this [or a folded white cleansing tissue] for wiping your brushes, matching tones, and for blotting up excess dye from the print.

3 A standard set of three bottles of photographic spotting colors. One bottle contains a neutral black liquid dye, one a blue-black dye, and one a sepia dye. Complete instructions come with these sets and tell you how to match the print tones of various printing papers. [Some papers print neutral blacks, some give "warmer," more brownish blacks, and some give blue blacks.] You'll probably be able to use the neutral black spotting dye "as is" much of the time–particularly for very small spots. For larger areas or for long lines you may need to mix shades to precisely match the tone of the printing paper.

4 A small glass of water for diluting colors and cleaning your brush.

5 Color patches–spotting colors in dry form. You mix these as you do watercolors, by dipping your brush in water and then applying the brush to the color patch to get the amount of pigment you need. The liquid dyes are preferred by many photographers, however, because these dyes actually sink into the emulsion. You can also apply them to almost any print surface, including "glossy" prints with a hard-finished surface.

6 A porcelain watercolor palette with sections for mixing your colors. You can also use separate small white dishes. [Don't use plastic; the dyes tend to sink in and stain it.]

How to spot prints

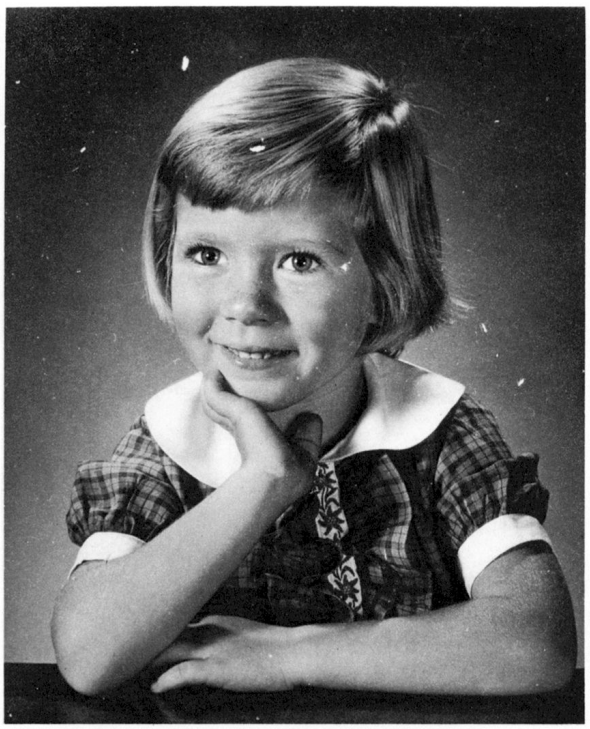
On a convenient work area, arrange your tools, materials, and the print that needs spotting. Work in good light with the illumination shining on the print, not into your eyes. What follows is a good procedure.

First, choose the shade of spotting color closest to the tone in the print you're going to work on. Often, the neutral black will be satisfactory. For a warmer tone, add a little sepia to the neutral black dye; for a cooler tone, add a little of the blue-black dye. Always shake the bottles of spotting color before using them.

Put a drop of dye in three sections of your *clean* palette or three dishes. [A small eyedropper is a handy tool for this.] It's best to work with just the amount of dye you can use up in one spotting session; unused dye left in the palette tends to change color.

Leave the first drop of dye at full strength. Using your brush, dilute the other two drops with a little clean water–the exact amount depends on the tones of the areas you're going to spot.

Test the shades you have mixed before applying them to the spots on the print. Put a little dye on your brush and, if you plan to trim off the



Unspotted print: The numerous small white dust spots and several large white spots all need to be filled in to make a clean, finished print. Also, the photographer wished to eliminate some of the stray hairs standing out from the little girl's head. The spotting technique he used and his final, corrected print are shown on the facing page.

border of the finished print, try the color out on the border. Or use a spare print made on the same paper, or else a piece of white blotter or white cleansing tissue will do. If the shade is too dark to match the area you want to spot, lighten it with a bit more water.

Now clean your brush thoroughly in the water and wipe it *dry* on the blotter or tissue. Pick up some of the mixed dye. Wipe the brush again several times on the blotter or tissue by twirling it between your fingers as you draw it toward you. This helps keep the brush tip pointed. The brush should now be semidry, which is best for spotting.

Always begin by spotting the *darker* areas first. Apply the spotting colors very sparingly, gradually building up to the tone you want with repeated applications. *Let the spotting color dry* between applications. It usually will dry rather quickly.

For small spots, apply the dye with a stipple motion–that is, repeatedly touching just the tip of the sharply pointed brush to the spot. With minute spots just a few touches with the tip of the brush may fill the area. With larger spots, work from the center out to the edges, using a stipple motion or very short strokes until the spot is filled in. Use very small curved strokes to match the tone of the outer edges of the spot with the surrounding area. Be careful not to apply too much dye at the edges or a dark, distinct line may form.

As you work and the brush begins to become too dry, moisten it slightly in the water or touch it with the tip of your tongue. When the shade left by the brush becomes too light, clear the brush by dipping it into your glass of water, and then wipe it on your blotter or cleansing tissue. Now dip the brush into the drop of the right color on your palette or dish, wipe on the blotter or cleansing tissue as before, and continue to work.

The dye may dry slightly darker than it appears when wet. Therefore, build up the tone gradually, keeping it lighter than the surrounding tone of the print until it dries to an exact match.

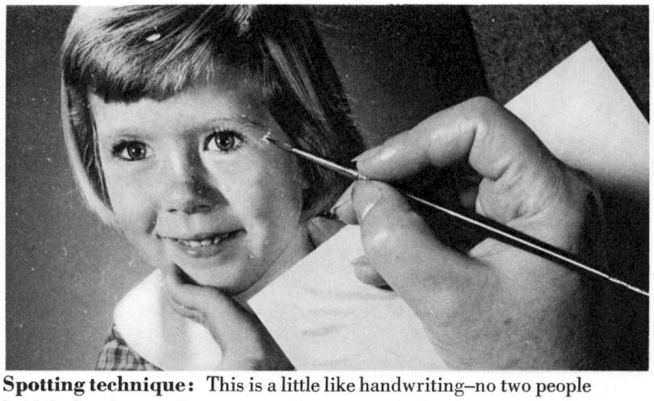
If you put too much dye on a spot, you may be able to blot up some of it with a piece of cleansing tissue wrapped around your index finger, or with a small, fine-textured sponge. However, if there was not enough hardener in the hypo when you fixed your print, the dye will tend to be more deeply absorbed by the print, and it may not be possible to remove it this way. For best results, apply the spotting colors with great care.

When filling in a white line, consider it a series of white spots to be filled in. Work from one end to the other, using a stipple motion or very short strokes. Just as with spots, you can build up the tone gradually with repeated applications, letting the colors dry between applications.

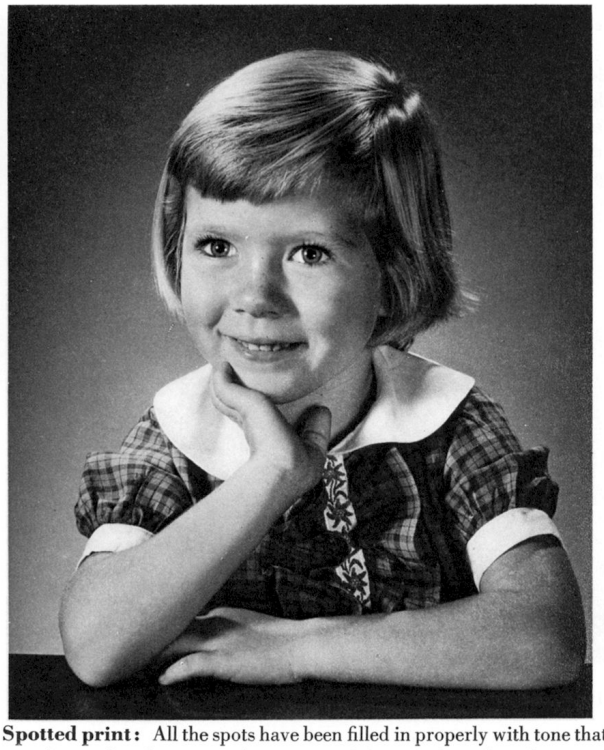
How to avoid spotting

Spotting can be a time-consuming job, and if your print has too many dust marks and scratches on it, you may save time and energy by remaking the print–after cleaning the negative carefully. While this cleaning will remove dust, it won't remove the scratch marks. If scratch marks are relatively minor, you often can eliminate them by applying a *very thin* coat of vaseline to the negative and rubbing it in well with your thumb and first finger. Use an extremely small amount of vaseline, and rub it into your thumb and forefinger before applying it. If you put too much on, the vaseline will print as streaks on the finished picture.

If you handle your negatives carefully [by the edges only] and use a hardening fixer, you should greatly reduce the chances of scratching them. If your prints consistently show fairly long white lines, especially running along the length of the film, have your camera checked by a competent camera repairman. Such scratches may be caused by the camera itself as the film is advanced from one frame to another.



Spotting technique: This is a little like handwriting–no two people hold the brush or apply spotting colors in exactly the same way. However, the method shown here is often used. The spotting color is applied by touching the sharply pointed tip of the brush to the print, using a stipple motion or very short, curved strokes. Not only must the tone of the spot match the tone of the surrounding area, but the spotting color must be applied so that it blends in with the surface quality of the area. For example, a spot on a smooth area, such as the background or the girl's face, requires a smooth, blended tone. But a rough, mottled area, such as a strongly textured fabric, would require a mottled effect.



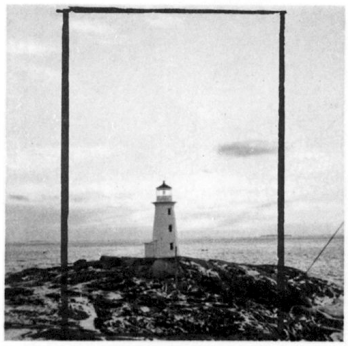
Spotted print: All the spots have been filled in properly with tone that exactly matches the surrounding area, and the stray hairs have been eliminated as well.
[Photograph by Harry Garfield]

Printing to emphasize mood

Some pictures are best printed straight, just as they appear in the negative. However, there are others that you can improve greatly by using the printing controls we've shown you–altering the print to emphasize some mood or emotional effect you want the viewer to feel.

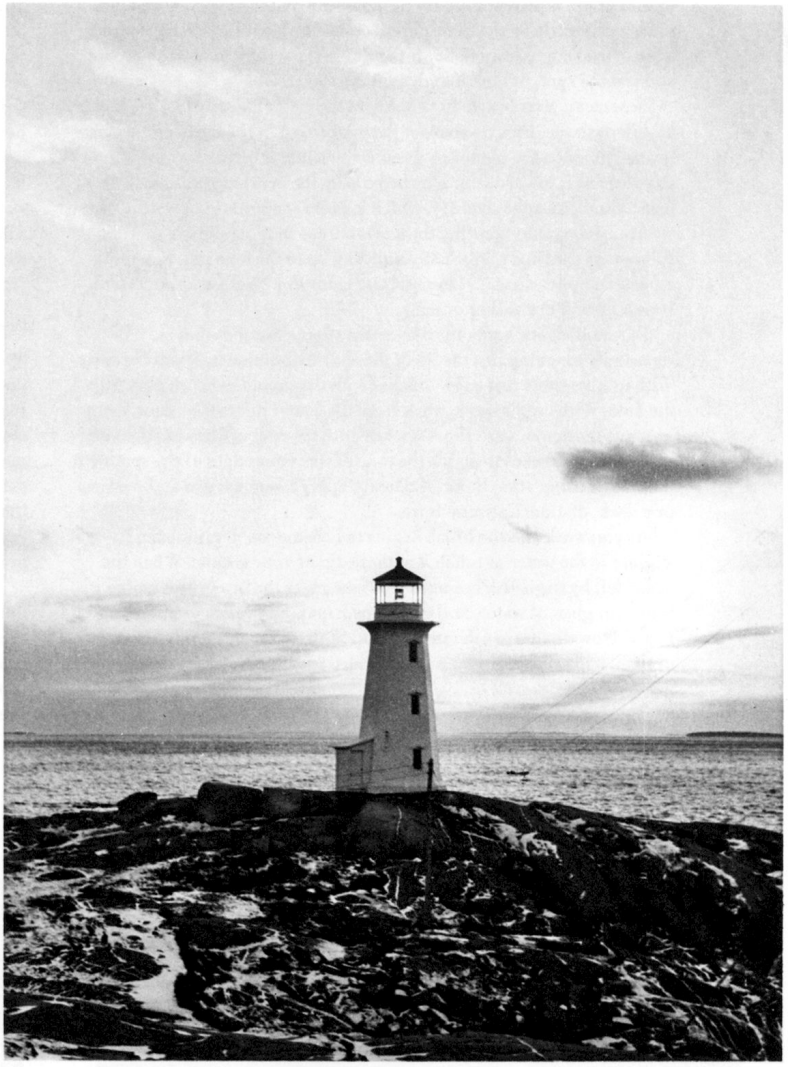
Before you enlarge, consider whether applying one or more of the creative controls will make it a better picture. Remember that you can print any negative in many different ways–lighter or darker, with more or less contrast, with various croppings, with different details emphasized or subdued through dodging or printing in. The challenge of darkroom work–its exciting, creative side–lies in printing the picture so that it says what you want it to. This is called "printing for content"–printing so that the picture communicates with greatest impact and clarity.

For an example of what we mean, see how printing is used in these photographs to evoke a mood. Notice how Victor Keppler, starting with a straight print that conveyed little emotional atmosphere, applied basic darkroom techniques until he created an outstanding picture that we can feel as well as see.



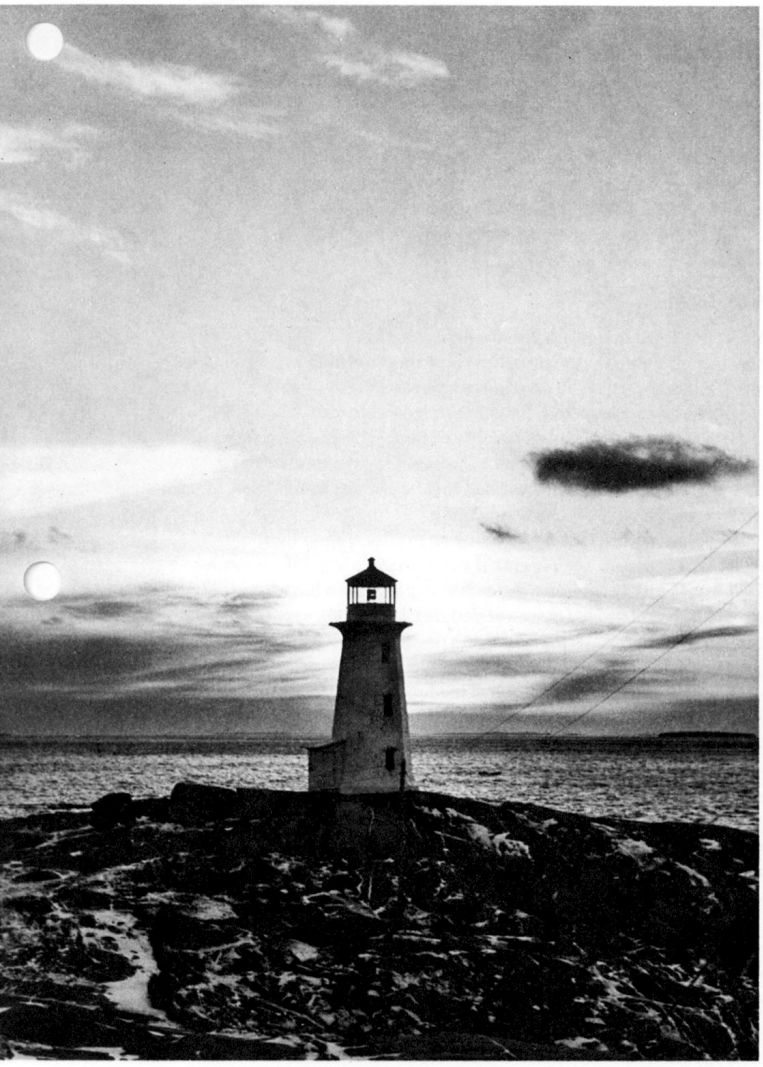
1 The straight contact print

Here, reproduced actual size, is a straight full-frame contact print of a lighthouse outlined against a sunset sky. The photographer's choice of cropping is indicated by the grease pencil marks.



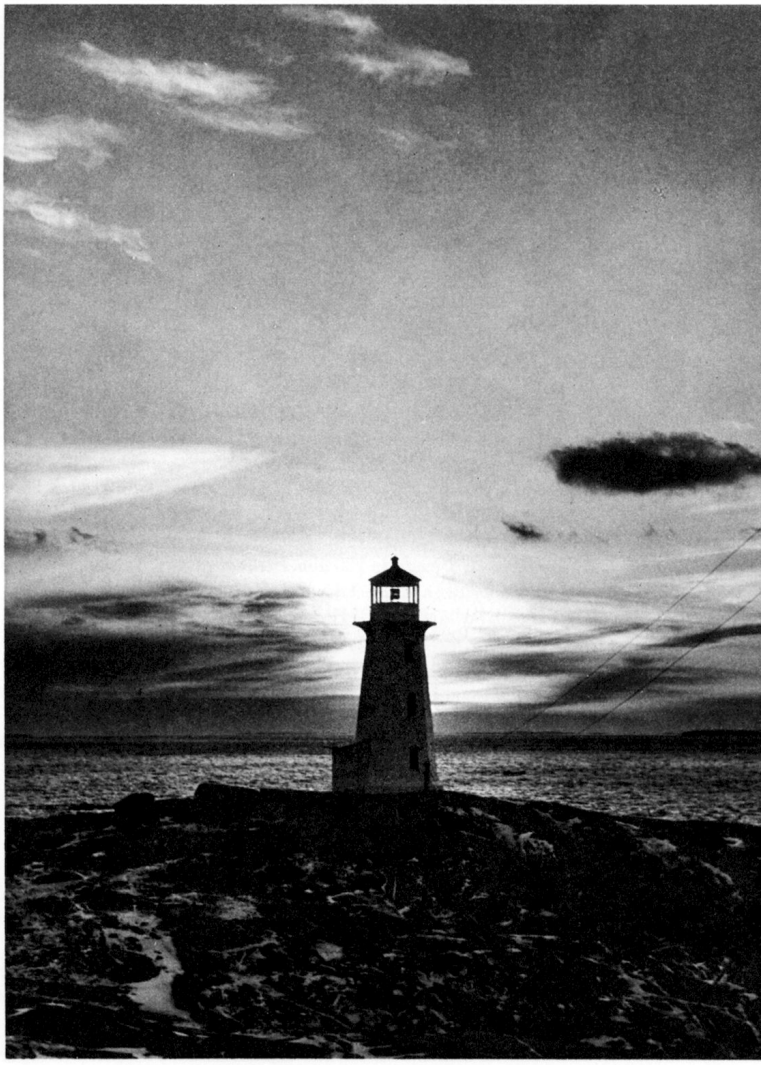
2 First enlargement

The photographer decided to tighten the composition and focus attention more strongly on the lighthouse by vertical cropping. Then he made a straight print, on a No. 2 contrast grade paper, giving a 14-second overall exposure and developing for two minutes in a standard paper developer. [The same paper, developing time, and developer were used for all these enlargements.] From the standpoint of technical quality, this is a satisfactory print. However, the picture is so light overall that we can hardly tell this is a sunset, and the clouds are too weakly reproduced. The effect is quite matter of fact–the picture does not create the mood of loneliness the photographer wanted to get across.



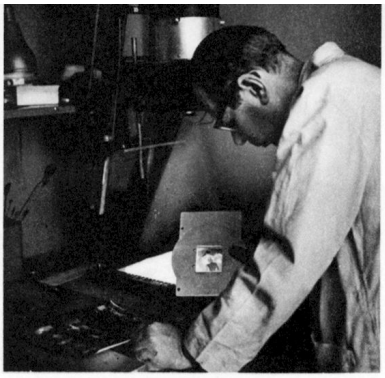
3 Second enlargement

This comes closer to expressing the sense of isolation of the lighthouse and the splendor of the sunset. Here, the photographer increased overall exposure to 25 seconds, and darkened the entire print. Then he printed in the sky area for an additional 20 seconds to make the clouds and the light from the dying sun stand out more strongly. The richer tones and more dramatic sky are an improvement, but the photographer felt that even these changes fell short of producing the full impact he wanted.



4 Third enlargement

Here the photographer increased overall exposure to 35 seconds, and then printed in the sky for an additional 45 seconds. The foreground rocks and the lighthouse have been deepened in tone until they are seen as shadowy silhouettes. Darkened even more than in the second enlargement, the sky has stronger contrasts now. The light of the dying sun appears brighter and provides a dramatic background for the lighthouse. Compare the first, straight enlargement with this last one and see how much more fully this low-key print expresses the photographer's idea. [Courtesy Calvert Distillers Co.]



How Philippe Halsman makes an enlargement

Once you have studied the basic techniques of printing and enlarging, one of the best ways to learn how to apply them is to watch an expert printer at work. Let's go into the darkroom with a member of your Guiding Faculty–Philippe Halsman–and see exactly how he prints one of his famous portraits.

For this demonstration Halsman chose his photograph of actress Audrey Hepburn, made on 120 film. His first step was to study the 8 x 10 contact proof sheet and select the shot that pleased him most.

"I always make contacts," Halsman says, "not only for editing and filing purposes, but also so I can study the photograph to decide what changes, if any, I want to make when I enlarge it. When I look at the contact, I'm usually looking at a good straight print. Sometimes you get qualities in a contact which you may lose in the enlargement, particularly if you become too involved in changing tonal relationships by dodging or burning in. That's why I like to keep the contact print at hand to refer to from time to time."

By Halsman's standards, the negative of the picture he selected [*bottom left*] had a normal density and contrast. Of course, each photographer has his personal standard of what is "normal," but usually a normal negative is one that will yield the kind of print he likes with a minimum of darkroom manipulation.

"I try," Halsman says, "to get a negative which will print well on No. 2 paper or variable-contrast paper without a filter. I want it to have the minimum density that will still give good detail in important shadow areas. So when I take a picture I usually overexpose slightly and then I slightly underdevelop.

"In this case, for example, I took the photograph on an overcast day, with soft, low-contrast illumination. A meter reading of the face indicated a basic exposure of 1/100 second at *f*/6.3 for the high-speed film I was working with. However, I increased the exposure by a half-stop and decreased my developing time by 25 percent.

"Looking at the straight contact print [*bottom center*] from this negative, I decided that it needed just a minimum of cropping–only enough on the sides to make a vertical print from the 21/4 x 21/4 square negative."

Preliminary steps

Before putting the negative into his enlarger, Halsman held the negative in its carrier under the enlarger light and very carefully brushed off the dust [*bottom right*]. Next he adjusted his easel for the vertical cropping he wanted, and focused with his enlarger lens wide open. He stopped down to *f*/11 and looked at the projected image. From experience with his enlarger, paper, and processing, he knew that the total printing exposure with the image projected at that brightness would allow him a comfortable amount of time for dodging.

When you're considering how long an exposure should be, remember to allow enough time for dodging if you plan to do any. Of course, a short amount of dodging during a short exposure can have the same effect as a considerable amount of dodging with a long exposure. For example, if your test strip shows that a negative requires 6 seconds exposure at *f*/5.6, your exposure also could be 12 seconds at *f*/8 or 24 seconds at *f*/11. But if an important shadow area needs dodging and should receive only half as much exposure as the overall print, you'd have only 3 seconds to dodge with the lens set at *f*/5.6. Consequently, even slightly too much or too little dodging would have a relatively great effect. And if you moved the dodging tool out of the dodging area even briefly, the effect might be noticeable in areas where you didn't want it. By stopping down to *f*/11, and thus increasing exposure time to 24 seconds, you reduce the margin for error and also have more time to control your dodging precisely.

"Be sure to remember exactly what lens aperture you stop down to," Halsman advises. "Later on you may want to open up the lens temporarily to print in dense areas of the negative, and then go back to your original setting again."

Negative: Here is the 21/4 x 21/4 negative Halsman used for this demonstration.

Straight contact print: This required very little cropping–just enough off the sides to give a vertical format, which Halsman felt made a more interesting, pleasing composition. The vertical cropping emphasizes the girl and the doves by eliminating some of the background.

Here's how Halsman cleans his negative. Holding it in the carrier at an angle under the enlarger light beam, he can clearly see any dust. He uses short downward strokes of the small brush to remove it and he cleans *both* sides of the negative.

Making an exposure test

To check contrast and overall printing time, Halsman made a test print on a small sheet of enlarging paper [*below*]. Since he is skilled in judging the negative in terms of his equipment and working methods, he only needed to make two exposures–12 and 15 seconds. The 15-second exposure gave tones overall that looked about right.

The 'blast' system

In exposing, Halsman uses what he calls "blasts" or "punches." These are three-second units of exposure. His timer is set so that when he pushes the foot switch the enlarger automatically turns on for three seconds and then turns off. The overall exposure is made up of a series of these short, three-second "blasts." Halsman finds this system makes it easier for him to keep track of overall exposure time and of how much time he spends dodging or printing in specific areas. For example, it's convenient to remember that a shadow area was dodged for two blasts, or that a highlight was printed in for three blasts.

Analyzing the print

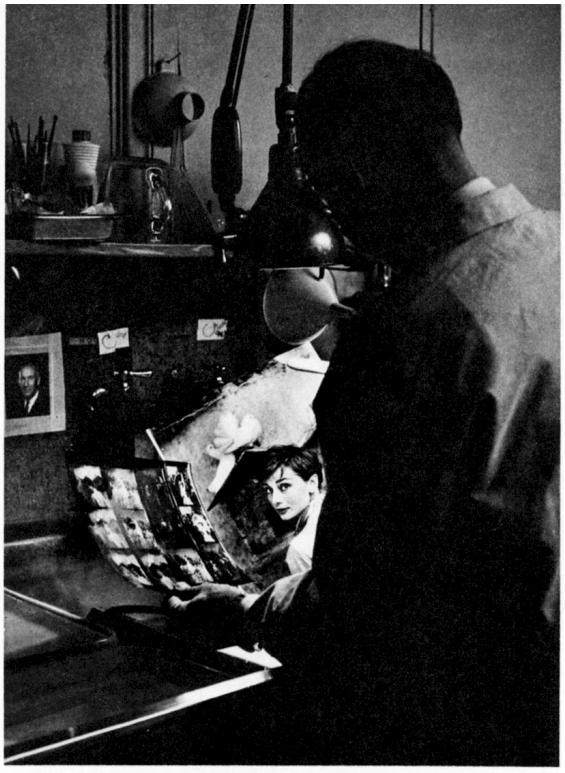
After the test exposure, Halsman made a straight enlargement [*below*], giving an overall exposure of 15 seconds [5 blasts]. The next step was to analyze this print.

"The print wasn't too bad as it stood," Halsman says, "but I felt it could be improved. The face and the background behind it are both too similar in tone. Also, the large expanse of shirt is too light–it contrasts so strongly with the background that it draws attention away from the focal point of the picture, the girl's face. Therefore, I decided to dodge the face to make it a little lighter, and to darken the shirt area by printing in.

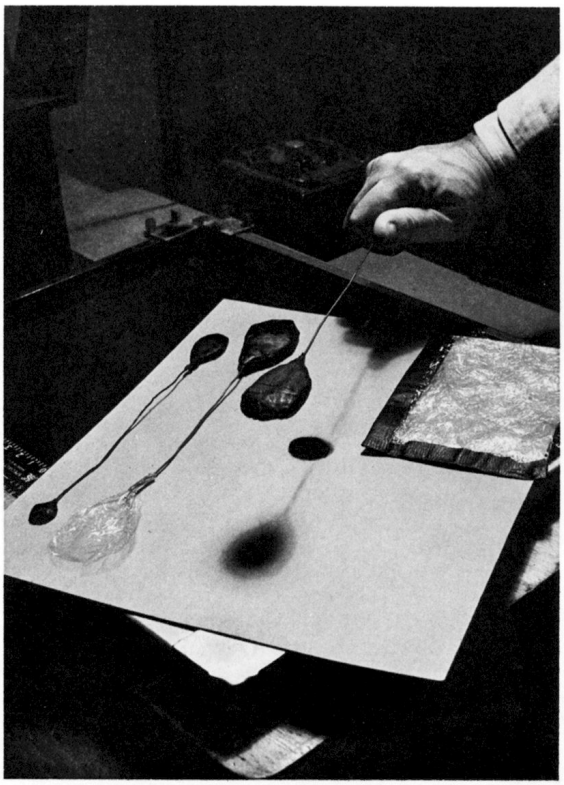
"I also felt that the doves and the wall behind them were too light and not in pleasing balance with the rest of the picture. Although the doves are an interesting element in the composition, they now distract somewhat from Hepburn's face. It seemed to me that the picture would be improved by printing in the doves and the wall to give them slightly more tone without making the whites go muddy."

Test exposure: Halsman gave the right half of the print an exposure of 12 seconds [4 blasts] and the left side 15 seconds [5 blasts]. The 15-second exposure looked about right.

Straight enlargement: Here's the straight, unmanipulated enlargement, which has been exposed for 15 seconds. Halsman felt that the face, which is the center of interest, did not stand out enough and that the shirt, the doves, and the wall behind them competed with it. Some correction by dodging and printing in was called for.



In judging his straight enlargement, Halsman compares it with the contact print and with his "standard" comparison print on the splashboard above the sink. A standard print–a portrait with normal skin tones–is a valuable guide when you study the exposure and contrast of any portrait test print.



Dodging tools: Halsman makes many of his own dodging tools. He bends a piece of thin wire to form loops at both ends of the size and shape he needs, then wraps them with masking tape. He uses the wrinkled cellophane dodger and the large piece of crumpled cellophane to soften detail in part of a print.

Making the print

After carefully studying the straight enlargement and planning his changes, Halsman began to work on the final print. This is the procedure he followed:

Blasts No. 1 and 2–overall exposure, no dodging.
Blast No. 3–overall exposure with right side of face dodged.
Blast No. 4–overall exposure with nose and remainder of face dodged.
Blast No. 5–overall exposure, with hair dodged.
Blasts No. 6 and 7–printing in of doves and wall.
Blast No. 8–printing in of doves only.
Blasts No. 9 and 10–printing in of shirt only.

Sometimes Halsman uses his hand for dodging or printing in large areas, but he finds special tools [*bottom left*] give him greater accuracy in working on small areas. "My hands aren't such acrobats that they can do everything," he says.

Paper and developing

For the most part, Halsman prints on a variable-contrast paper and, as he indicated earlier, he does not use filters during the overall exposure. Instead, he reserves his filters for dodging or printing in. For him, the advantage of this procedure is that he can *change contrast in part of the picture only*. He generally uses just one high-contrast and one low-contrast filter, rather than the entire set. We'll fully explain his use of these filters in a later lesson.

Halsman prefers glossy white, double-weight, variable-contrast enlarging paper. The glossy white surface provides the wide tonal range which is most pleasing to him, and it also is generally preferred for reproduction. Like most other professionals, he always prints on a double-weight paper because this holds up better under repeated handling by picture editors and art departments.

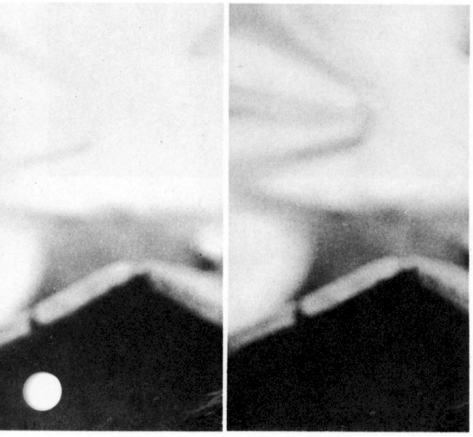
Halsman develops his prints in standard paper developer and fixes in a standard-formula fixing bath. He uses a *two-bath* method for his fixer, which increases the number of prints a given amount of fixer can properly fix. In his darkroom sink he has two trays of fixing solution. He puts the print in the first tray for half the fixing time, then transfers it to the second tray for the remaining time. Naturally, the fixer in the first tray wears out more quickly than that in the second tray, so after he puts twenty 11 x 14 prints through, Halsman discards the fixer in the first tray. He then reverses the positions of the two trays and pours fresh fixer into the empty tray. While this two-bath system gets the most out of the fixer, it's probably worth doing only if you're processing a large quantity of prints, as Halsman frequently does.

Finishing touches

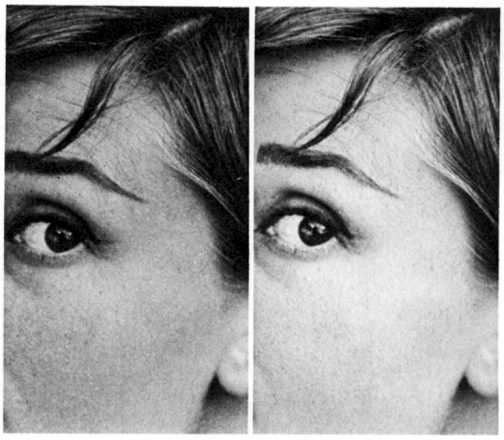
Halsman washed the finished print and let it dry by his usual method. First, he places the print face up on a clean towel and removes excess water with a rubber squeegee blade. Then he turns the print face down and allows it to dry overnight. To flatten the print [which tends to curl when drying], he presses it under heat in a *dry-mounting press*. This is an electrically heated unit for mounting finished prints on a cardboard backing, but it also works well for this print-flattening purpose, too. Finally, Halsman spotted the print.

Final print

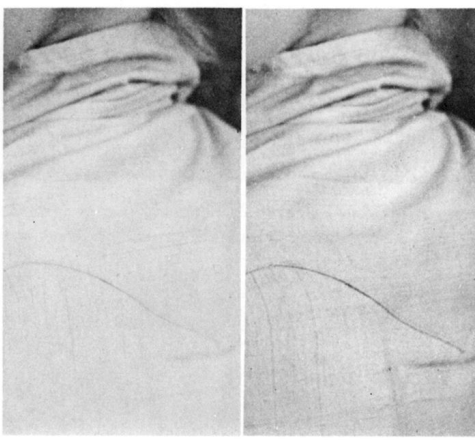
Here is Halsman's final print with the values adjusted so that we see Audrey Hepburn exactly as he wanted us to. Her face, the most important part of the picture, attracts our attention more emphatically now because it is lighter in tone. Every interfering element has been subordinated to it–the shirt has been darkened quite a bit, and the wall and the doves have been made slightly darker, too. At the bottom of the page we have reproduced details from three of these key areas–the doves, the face, and the shirt–from both the straight print and the final manipulated print. Compare them and note to what extent Halsman changed the values through dodging and printing in.



Straight print Final print



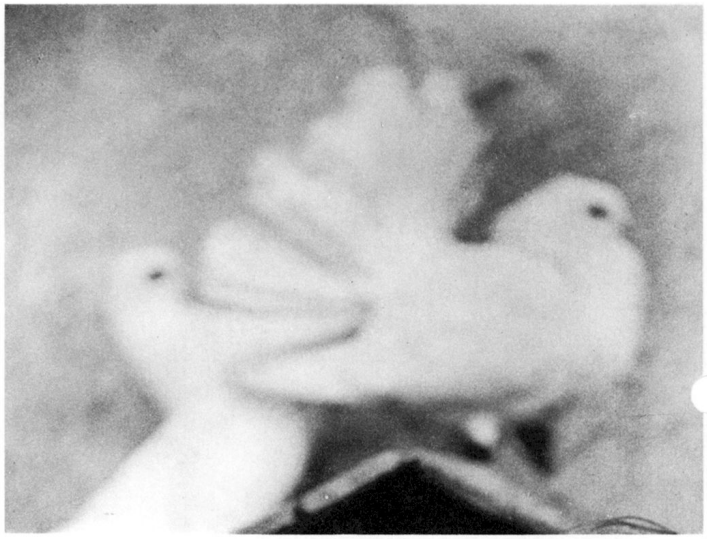
Straight print Final print



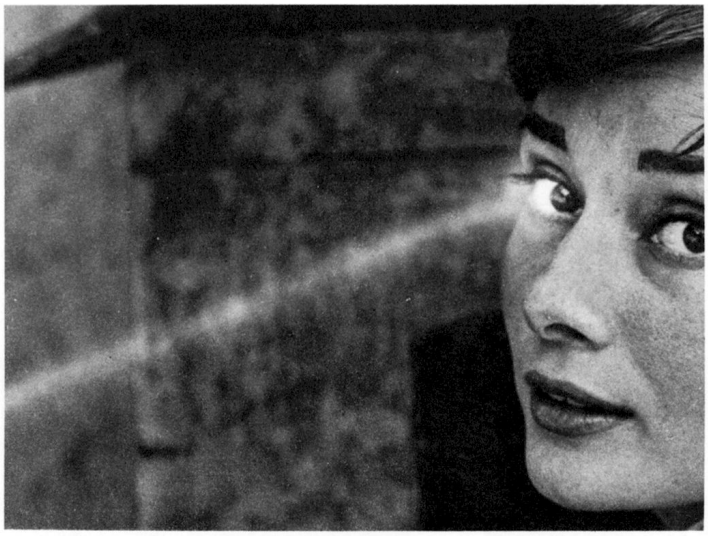
Straight print Final print

Three common errors in dodging and printing in

"Dodging or printing in is successful when it emphasizes what you want it to emphasize, but you can't tell it was done," says Halsman. Dodging and printing in should be used to make *minor* adjustments. If you alter the tonal relationships of a print drastically, the adjustment is almost certain to be obvious. Here Halsman shows three common faults in manipulating an enlargement and explains how you can avoid them.



"You must keep your hand or tool constantly moving. To burn in the dove and the wall I used a sheet of cardboard with a hole in it. If I had held it in one spot too long the result would have been what you see here. Not only do you get a spotty, obviously burned-in area, but the whites go muddy. Don't overdo burning in or it will produce muddy, grayed-over whites like this."



"If you don't keep the handle of your dodging device moving as well as the tip, its cast shadow may produce a streak on the print, like this."

"Excessive dodging of a dark tone, such as the hair in this example, can produce an unnatural-looking effect, like this. Use dodging to lighten dark shadows or details somewhat, but don't try to alter the tones too much."

The goals of printing

In this lesson we've shown you the basic methods for making contact prints and enlargements, and demonstrated some of the flexible, sensitive controls you can apply to obtain the results you want. Printing is both an art and a craft. Like the taking of a picture, it is an extension of your seeing that involves both creativity and technique. The way you decide to print any negative will depend on what you want the picture to say, on the use to which it will be put, and on your individual taste.

As you study the reproductions of pictures by your Guiding Faculty and look at prints made by other photographers, you'll discover a wide variety of personal printing styles. Some photographers try to achieve the greatest possible gradation of subtle tones that printing paper can produce. They like a "luminous" print that glows with silvery grays, radiant whites, and transparent shadows containing ample detail. Others prefer a bolder, more contrasty kind of print with dramatic blacks played against pure whites, emphasizing design rather than a wealth of tones and detail. Some printers tend to make dark, powerful low-key prints, and others favor bright, delicate high-key effects. In fact, printing style can be as unique and personal as handwriting.

How can you achieve a personal style of your own in printing? Mainly *by making many prints*. Style is something which will develop naturally from your growing experience in the darkroom. It is not something you consciously can impose on your prints, unless you are satisfied merely to imitate the features of some other photographer's printing style.

In the beginning, then, don't overly concern yourself with finding a distinctive, personal printing style. Let it come–as it will–in its own due course. Your immediate concern is to master the fundamentals of your craft. First of all, this means you should know how to recognize and make a "good, normal" print.

What is good print quality?

Any definition of "good" or "normal" print quality is bound to be somewhat subjective because different viewers have different tastes and reactions. Give the same negative to a dozen photographers, ask them to make the best possible print from it, and you are likely to find considerable variation among the results.

However, in spite of these natural differences, there are certain widely accepted standards of good, normal print quality. These standards apply especially to commercial work intended for reproduction. It's useful for you to know and understand these standards–they can provide you with a goal as you learn the basic techniques of printing. Later on, many of the assignments you may receive as a professional or that you choose to do for yourself will call for prints of this quality.

First, and perhaps most important, a good, normal print will reproduce the tones in the subject accurately enough to *look natural and convincing to the average viewer*. The picture will neither be too light nor too dark, but will simulate the tones you would expect to see in the subject itself.

Notice, we said *simulate*. A print may not duplicate exactly the values in the subject. For example, a landscape on a bright sunny day may have areas of bright sunlight that are one thousand times brighter than the darkest shadows. It is beyond the limits of black-and-white printing to match this tremendous range of brightness. [Even in a good print, the pure white highlights will only be about thirty times brighter than the darkest blacks.] However, the print can *suggest* the way the scene looks by making full use of the values that the paper can produce.

This brings us to the second characteristic of a good, normal print. It contains a *wide scale of values*, ranging from strong black through many gradations of gray to pure white. [In a print, of course, the purest white possible is the blank surface of the paper stock itself.] Another way to express this is to say that the print has *normal contrast*. It is neither weak and flat nor harsh and contrasty. A good print has a richness and depth created by full tonal gradation.

As a third characteristic, it will *contain detail in important shadow and highlight areas*. That is, a good, normal print usually has no large areas of solid black shadow or completely washed-out highlights. Pure blacks and pure whites will be confined to very small areas such as the darkest darks within a shadow, or the highlights in a person's eyes.

The easiest way to produce a good print is to begin with a good negative–one that is sharp, correctly exposed and developed, and contains normal density and contrast. However, even the best of photographers doesn't achieve such an ideal negative every time he shoots. Equipment can malfunction, errors can be made, and the conditions under which you take pictures may not always be perfect. Starting with a less-than-ideal negative, you can apply your knowledge of printing controls to produce the best print possible.

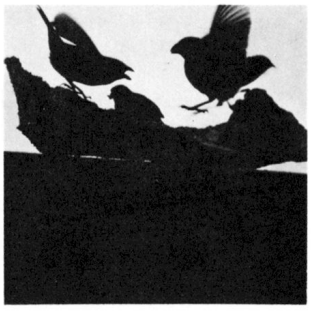
Printing as a creative decision

As you become more skilled in printing, you may sometimes find that a "normal" print is *not* the most effective way of expressing your ideas and emotions, of putting your pictures across with the greatest clarity and impact. You may decide to vary the print away from the normal in order to achieve a more vivid, eloquent picture.

Concerning this creative aspect of printing, Philippe Halsman says: "It is wrong to think that every negative can produce only one kind of print. Printing a negative is *interpreting* a negative. For example, if you use a low-contrast paper or filter, you will produce a softer, less dramatic picture. If you use a paper or filter of high contrast, your prints will be more forceful, dramatic, even strident. You can make either a light print to make the picture look gay, transparent, and delicate, or a dark one to make it look gloomy, heavy, and tragic.

"Therefore, while printing a negative, you should not necessarily try to make a 'perfect' print, with all the gradations of the gray scale. You should first ask yourself, 'What emotion or atmosphere do I wish to convey?' Then take the steps to achieve this goal."

Only you can decide whether a particular negative should be printed to produce a conventionally good, normal print, or whether it should be varied. As a creative photographer, your goal in the darkroom, as when working your camera, should be to produce the clearest, strongest visual statement of what you want to say.



Technical notes on the photographs

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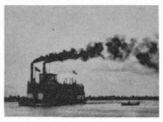

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Lesson

6

Color photography

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The challenge of color photography

We live in a universe of color, natural and man-made. There is color in the sky above us, in the earth around us–in woodland, river, mountain, and desert. There is color on our own bodies and in the thousand-and-one objects, practical and impractical with which we surround ourselves. Color is a basic part of our lives.

We experience color with our feelings as well as our eyes. The flaming reds and yellows of the sunset excite our admiration. A clear blue sky exhilarates us, while a gray overcast day makes us feel gloomy or depressed. Clothing, food, or pictures may look attractive to us–or extremely unattractive–simply because of their colors. Color can stir, sooth, disturb, or disgust us.

Manufacturers understand the importance of color and use it to draw attention to their products. Colors used in packaging, advertising, and in the products themselves are often chosen only after detailed color research. Designers and decorators are vitally concerned with color and its psychological impact on people. And artists, of course, use color as one of their most powerful means of expression. As a photographer, you are concerned with color as much as anyone, since it provides you with a creative means of evoking emotional responses and making your pictures more vivid and meaningful.

Color photographs are in great demand today, and they bring a considerably higher price than black-and-white pictures. They are used extensively in journalism, industry, and many other fields. They have an established place in national advertising, where you see them in newspapers, magazines, and mailing pieces, and on billboards and television. People are becoming more and more conscious of color and they want and expect to see color photographs in publications of all kinds.

If you can produce pictures that successfully fill this demand, you have a wonderful opportunity to enjoy financial success, the prestige of publication, and the personal satisfaction of mastering a glamorous, exciting medium. This is the promise of color photography. Its challenge lies in finding your own way to use color–not only as a literal copy of reality, but as a unique expression of your personality.

Color photography is a young art, even compared with the relatively brief life-span of black-and-white photography. Creative photographers are only beginning to explore color deeply and discover its possible range of effects. Working in color offers you the thrill of pioneering. Much remains to be discovered in the domain of color photography–new techniques, new applications of methods and materials, new ways of seeing and recording color creatively. Perhaps you will be one who makes some of these discoveries.

Acquiring the fundamentals

Photographers have their own way of looking at color and in this lesson we will familiarize you with it. We begin by explaining the nature of color to you, to help you see it and judge it more precisely. Then we demonstrate important ways that light can affect the color in your pictures. With this information in mind, you'll be ready to learn about the basic materials–color films and filters for color–and the techniques for using them and handling exposure problems. Finally, we emphasize the imaginative control of color–how members of your Faculty use it as an element of composition and for the psychological effect it has on the person looking at the picture.

All the members of your Faculty use color at times, and some shoot almost entirely in color. In more advanced lessons they will describe their special color methods and approaches in portraiture and photojournalism, and in industrial, architectural, fashion, advertising, and editorial photography, and other special applications. But to get the most benefit from this advanced instruction you first should master the basic ideas and techniques taught in this lesson.

Working with color

Generally speaking, the same qualities that make a good black-and-white photograph also make a good color photograph. Both contain a visual image which communicates to the viewer in an interesting and effective way. Each is a meaningful statement made in the picture language of photography. The essential difference is that a color picture *uses color as part of the picture language.*

It's just as easy to take a picture in color as it is in black and white. Millions of technically adequate color shots are taken with simple cameras every year. But to make a photograph in which the color itself really contributes to the picture's meaning requires a trained awareness of color and an understanding of its emotional and compositional aspects.

Unlike black-and-white film, color film has *three* layers of emulsion, each recording light of a different color. The chemistry of color photography is therefore more complex. There are two main types of color film: transparency film and color-negative film. With transparency film you get color transparencies or slides which you can look at through a viewer or project onto a screen. This kind of film is usually processed by the manufacturer or a color-processing laboratory. Once you've taken the picture, there's relatively little you can do to alter the final results. With color-negative film you get negatives from which you can make prints, and you have a measure of darkroom control comparable to that in making black-and-white prints.

Although color photography is sometimes less predictable and less subject to direct control than black and white, the difference is only one of degree. In this lesson and throughout the remainder of the Course we'll emphasize the things you can do to control color when you take the picture. Carefully chosen props and backgrounds, selection of the right film, filters, and lighting, and attention to composition, camera angle, and the moment of exposure will all help you produce good color pictures. A skilled and imaginative photographer can control color with great effectiveness.

The sheer fact of producing a picture in full color is exciting. By their very nature, color photographs are impressive. But don't be too easily pleased with your results. Don't be content to use color in your pictures just for the sake of decoration. And don't be satisfied with color pictures that are exactly like those any other photographer could make of the same subject.

It's up to you to use the remarkable materials of color photography and the evocative effects of color in your own way–to put the imprint of your unique personality and vision into your color pictures. This takes skill and artistry–and is what makes color photography so challenging.

[*Facing page*] In the photograph at left Bert Stern has taken very simple forms–a cone, a cylinder, and a circle [the setting sun]–and three basic colors–green, red, and blue–and created a picture that has a strong, unearthly beauty. In this lesson we'll not only demonstrate the basic techniques of color photography but also show you many ways you can use color *expressively*, as Stern did here, to make your pictures communicate more effectively.
[Courtesy *Graphis*]

Color or black and white?

Often when you take a picture you may have a choice between shooting it in color and shooting it in black and white. How do you decide which it should be? An intelligent choice depends on the subject and what you want to say about it.

A good color picture is *not* just a picture that happens to be taken on color film. The color must serve a purpose. It should *work* as an important element that enhances the mood, expresses your picture idea, and makes the photograph communicate more strongly and vividly.

Irving Penn has defined a good color picture as "a good photograph made in color, *where the color is necessary to fulfill the photographer's statement.*"

This definition provides you with a useful standard for deciding whether to use color or black and white. Ask yourself: Is color really needed to express what I want to in this picture? Unless the answer is yes, you should probably shoot it in black and white.

For an example of a subject that is more effective in color than black and white, compare these two photographs by Arthur d'Arazien of a steel mill in action. The photographer wanted to convey a sense of the tremendous heat generated by the molten metal. In the black-and-white version we can see the sparks, the glare, and the molten steel [the picture was printed in at the top and bottom to focus attention on the pouring metal]. But when we look at the color version, with its hot yellows and oranges, contrasted with the cool blues in the background, we can almost feel the heat. Color gives the subject greater impact than it has in black and white. It is used in a significant, story-telling way to reinforce the mood and meaning.

From a purely practical standpoint, your decision to shoot in color or black and white will often be based on how the picture is to be used and whether it will be reproduced in color or black and white. A picture for a color advertisement or one to be projected as a color transparency for an audience would naturally be made on color film, and an assignment for a magazine with black-and-white reproduction would be made on black-and-white film.

If you plan to shoot an assignment in color, naturally you will look for a different type of picture than if you were shooting in black and white. You will try to find subjects in which the color helps to tell the story–where it isn't distracting or superfluous, but makes an important or essential contribution to the meaning of the picture. [Photographs courtesy Jones & Laughlin Steel Corp.]

The three dimensions of color

Because color exists all around us, and is so much a natural part of our everyday experience, we sometimes take it for granted. However, as a photographer, you'll need to be keenly aware of color–and to look at it in a new, precise way–if you are to use it effectively.

There are two systems used to describe color–the *subtractive* and the *additive*. The subtractive system is the one we shall work with here. It deals with the colors you obtain by *mixing various pigments*. This is the system you may have studied in school or in an art course. It's convenient to use when we want to describe the effect of various colors as our eyes see them, either in the subject itself or a color photograph. [The additive system, by contrast, deals with the *colors of light*. It's helpful to know some facts about the colors of light when you process color film or make special uses of various filters for color photography and so this system is discussed in your Technical Manual.]

As a photographer, you are most concerned with recognizing and controlling three aspects or dimensions of color–its *hue*, its *saturation*, and its *brightness*. Here we explain these dimensions. Then we'll show you various ways to control them, and how to use them to make your color pictures more exciting.

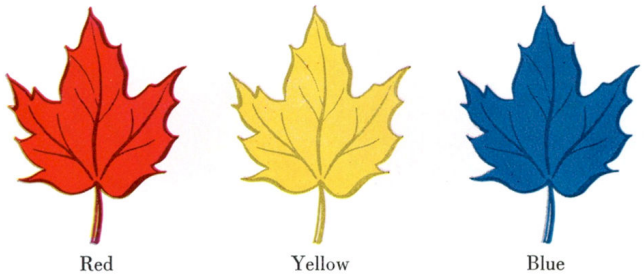
1 Hue

Hue is the *name* of the color: yellow, red, green, blue, purple, etc. It has nothing to do with whether the color is light or dark, strong or weak. Look at the three leaves reproduced in color below. Unless you are color blind you can easily recognize that one is red, one yellow, and one blue. The three leaves are different in *hue*.

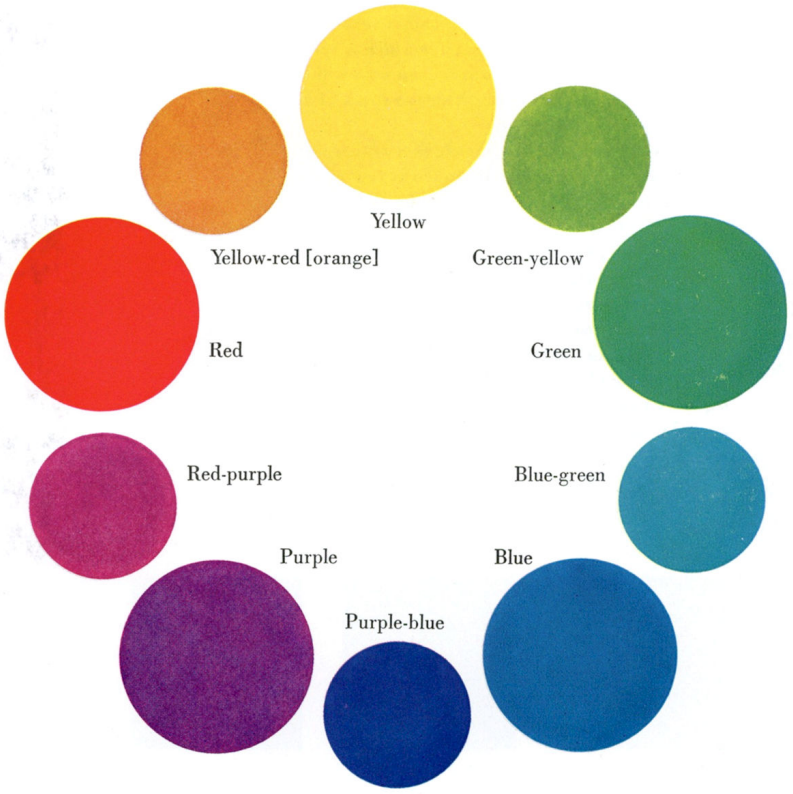
The various hues can be arranged to form a *color wheel* like the one at the right. The order of the colors in the wheel is the one in which they naturally fall when white light is passed through a prism to form a spectrum–red, orange, yellow, green, blue, and purple. This order of colors is exactly the same as in a rainbow. [Of course, in nature the various hues blend gradually from one hue to another, while in the color wheel they are arranged in separate patches, each of a distinctly different hue.]

Study the color wheel and its captions carefully. Notice that the closer together colors are on the wheel, the more related and harmonious they seem, because each color contains some of the color lying next to it. The farther apart they are, the more they contrast with each other. Colors that are directly opposite each other, such as red and blue-green, are called *complementary* colors and form the greatest contrast.

Hues and the different effects they create when arranged in certain combinations provide you with one of your basic tools for composing in color. For example, suppose you want to achieve a restful quiet effect in a picture. In this case you might choose objects closely related in color. On the other hand, if you want to create a feeling of excitement and drama, you might use strongly contrasting hues.
[*Continued on next page*]



Red Yellow Blue



This color wheel shows the hue of various colors

Related colors are colors that are close to each other on the wheel, such as yellow-red, red, and red-purple. *Contrasting* colors are those that are far apart. The greatest color contrast is between *complementary* colors. These are colors which lie opposite each other on the wheel, such as yellow and purple-blue or red and blue-green. Red, yellow, and yellow-red are *warm* colors; blue, green, and blue-green are *cool* colors. Colors in between these warm and cool extremes, such as purple and green-yellow, are less clear-cut in their effect. They seem neither distinctly cool nor warm.
[Color chart ©Munsell Color Co., Inc.]

Hue [*continued*]

There's another aspect of hue you should understand–the warmth or coolness of a color. When you hear photographers talking about *warm* and *cool* colors they are discussing hue. In general, yellows, oranges, and reds are considered warm colors, while blues and greens are considered cool.

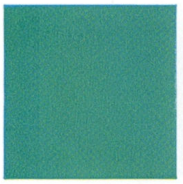
There's a very simple reason for calling hues warm or cool. These words describe the physical sensation we might feel if surrounded by large masses of such color. From daily experience we associate red, yellow, and orange with the sun, flame, and fire. Thus, they suggest *heat*. By contrast, cold, deep water is blue or blue-green. Ice often has a green or blue cast. Therefore we tend to associate these colors with *cold*.

The colors halfway between these warm and cool extremes, such as green-yellow and purple, are more neutral in their effect; they seem neither very warm nor very cool. However, a green hue which is very close to yellow strikes us as warm compared with a green that contains more blue. Thus we speak of a warm green or a cool green.

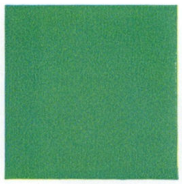
This same distinction applies to every other hue. Let's take red, for example. If the red is yellowish, it's a warm red. If it contains some blue, it's a cool red.

In general, any hue is warm if it contains yellow, and cool if it contains blue.

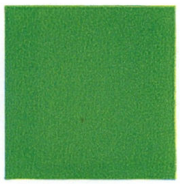
As a photographer, it's well for you to keep in mind that hue does not depend only on the pigment in the object you are photographing. It also depends greatly on the illumination. For example, the same leaf may look warm and green-yellow in the bright sunlight, but a cool blue-green in the shade.



Cool [bluish] green

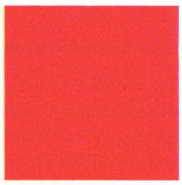


Green



Warm [yellowish] green

Cool [bluish] red



Red

Warm [yellowish] red

Any color can be considered warm or cool depending on the amount of yellow or blue it contains. For example, compare the three hues of green above. Pure green is a predominantly cool color. However, the yellowish green is relatively warm, while the bluish green is even cooler than the pure green.

Now compare the three hues of red. In the middle is pure red, a warm color. The yellowish red is even warmer, but the bluish red is relatively cool.

2 Saturation

The second dimension of color is its saturation–that is, its *intensity* or *purity*. The stronger or more intense a color is, the more "saturated" it is. For example, a strong, intense red is more saturated than a dull, grayish blue.

The leaves reproduced below show differences in saturation. The leaf at the right is a stronger, more intense red than the one at the left. It is more fully saturated. However, the hue remains the same–red. Note that the brightness hasn't changed–one leaf is not darker or lighter than the other. The only difference between the two leaves is in the amount of color saturation.

To understand saturation better, it's helpful to consider some examples from our daily lives. The color in a pair of blue jeans is most saturated or intense when they are new. With repeated washing, the color becomes dull and faded, less intense. The color of a house is at its maximum intensity when freshly painted. The colors of a landscape lose their intensity when seen through fog or smoke, and regain it in brilliant sunlight. Colors in the distance are reduced in intensity, as compared to the same colors seen close up.

You can control the saturation of colors in your picture to a considerable degree by the kind of light and the kind of film you use, and by the way you expose that film. You often can achieve a wide range of effects–from rich, fully saturated colors all the way to delicate, less saturated ones.

Pure, strong, fully saturated colors can be direct and powerful in their emotional effect. This is the kind of color children and primitive artists often use. The impact of color contrast is greater when the colors are fully saturated. An intense, pure red seems to vibrate when it's next to an intense, pure green. Heavily saturated colors of contrasting hues seem to clash, creating a sense of excitement, drama, and motion.

On the other hand, muted, unsaturated colors tend to be more restful and their effect is often more poetic and sophisticated. Contrasting hues such as red and green still stand out clearly from each other, but in a more subtle, less blatant way. Later on we will show you examples of both muted and fully saturated colors used creatively by members of your Guiding Faculty.

Low saturation

Heavy saturation

3 Brightness

Brightness is the third dimension of color. It means the *lightness* or *darkness* of a color. Brightness is similar to value, which we discussed in an earlier lesson, "Composing Your Photographs."

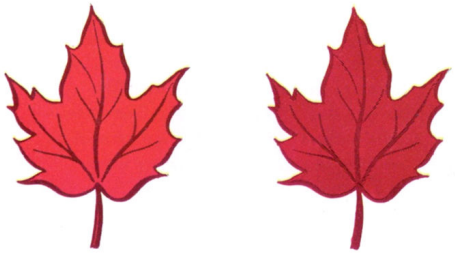
Many photographers, even experienced ones, tend to confuse brightness with saturation. Actually, in color photography, a change in one often is accompanied by a change in the other. [Compare the two photographs of the ballet dancers for a demonstration of this.] However, brightness and saturation are *not* identical but are two separate dimensions.

To see what we mean, look at the two leaves below. Both are the same hue and are equally saturated. They contain the same percentage of color. However, the leaf at the right is considerably *darker* than the leaf at the left. Not stronger in color, just darker.

By choosing your lighting and exposure, and by other means, you can control the brightness of the colors in your pictures. The emotional and visual effect of brightness in a color photograph is generally similar to the effect of value in a black-and-white picture. Dark colors tend to create a somber, heavy, or dignified mood. Bright colors tend to suggest a gay, light, airy, and feminine feeling.

Think of all three dimensions of color–hue, saturation, and brightness–as elements of composition that can help your picture communicate more vividly. It's important that you understand what these three dimensions are. It's even more important that you train yourself to see them more exactly as they occur in nature and under your control in the studio.

Changes in saturation and brightness often occur together, as demonstrated in these pictures by Irving Penn. In the upper photograph the colored costumes are generally lighter and less saturated than they are in the other picture. Penn exposed fully for the costumes to produce this effect. In the lower photograph he experimented with less exposure; the colors in the costumes not only are darker, but also are more fully saturated. For example, compare the richer, darker reds, blues, and greens in this picture with the lighter, more pastel colors in the top picture, which had more exposure. Which effect is "better"? That's a matter of taste and purpose. The upper picture reproduces the colors more accurately, but the darker, stronger colors in the lower picture contrast less sharply with the dark background. As a result, the eye is drawn to the smaller but relatively brighter figures in the background. Thus saturation and brightness, as well as hue, can play an important part in a color photograph's composition. [Courtesy RCA]



Light Dark

How light affects color

All photographs are produced by light, and the particular kind of light has a significant effect on the hue, saturation, and brightness of the colors your camera records.

The light used in photography can vary in a number of ways. Let's look at three of the most important of these and see what they do to the colors in your pictures.

1 Intensity: The intensity of the light is what your exposure meter measures when you take a light reading. This intensity can vary greatly. The light of the sun at noon on a clear day is much more intense than it is on an overcast day; a small living-room lamp produces much less intense light than a powerful studio lamp. The intensity of the light affects the colors in your picture—particularly their brightness and saturation. The more *intense* the light, generally the *brighter* and *more saturated* the colors tend to be. On a cloudy or rainy day, for example, most colors appear duller and less saturated than they do when the sun is shining brilliantly. Your choice of the intensity of your light, either indoors or out, is one of the important ways you can control the color in your pictures and make it strong and posterlike or soft and pastel.

2 Quality: By the quality of light we mean whether it is harsh and contrasty or soft and low in contrast. Harsh, contrasty light, such as the brilliant light from a spotlight or the sun, causes distinct highlights and clearly defined shadows. Light which is soft and low in contrast, such as the diffused light from a floodlight or the sun on a hazy day, causes even illumination with blurred, indistinct shadows or almost no shadows at all. The quality of the light affects the brightness and saturation of the colors in a photograph. The *harsher* and *more contrasty* the light, the *brighter* and *more saturated* the colors usually will appear.

3 Color: The rays of light that come to us from the sun we call "white" light. But so-called white light may vary considerably in its color. It may be warm and contain a relatively larger-than-normal amount of yellowish light, as the illumination from the late afternoon sun or electric-light bulbs does. On the other hand, white light may be cool and contain a larger-than-normal amount of bluish light, like the light in the shade of a building [under blue sky] or on overcast days. Light may also contain an unusual amount of other colors—green, for example, when the light is filtered through the leaves of a tree, red when it is reflected off the side of a red barn, or yellow when it is reflected off a yellow wall.

Our eyes readily adapt to these subtle variations in the color of light, and accept all of these types of light as white. For instance, most of us fail to notice any difference in the colors of objects viewed under the yellowish light of a living-room lamp and under the much more bluish light outdoors on an overcast day.

However, color films don't have this kind of adaptability. They are

Different light, different color: These two pictures by Irving Penn show how different lighting conditions can alter the hue, saturation, and brightness of colors. Penn took the picture above on a bright, sunny day. The intense, contrasty light produced bright, highly saturated colors and deep shadows in which most of the detail and color is lost. This light emphasizes the warmth of the flesh tones, the brown rocks, and amber highlights in the water of the pool. See what a dramatic change occurred when Penn photographed the same subject on an overcast day. The light was less intense, more diffused, and much cooler. The rocks are purplish now, and the flesh tones are cooler and less saturated. The pool is a cool blue and the shadows are softer. Penn used the same film and no filter for both shots, but the change in the light created two markedly different effects. [Courtesy Stopette]

designed or "balanced" to give you normal colors under a specific type of light–daylight, flashbulbs, or studio lamps, for example. If you use a warmer or cooler light source than the one for which the film is designed, you'll get an overall *change in hue*. The colors will be reproduced warmer than they look to the eye if the light source is warmer than the one for which the film was designed, and cooler if the light source is cooler.

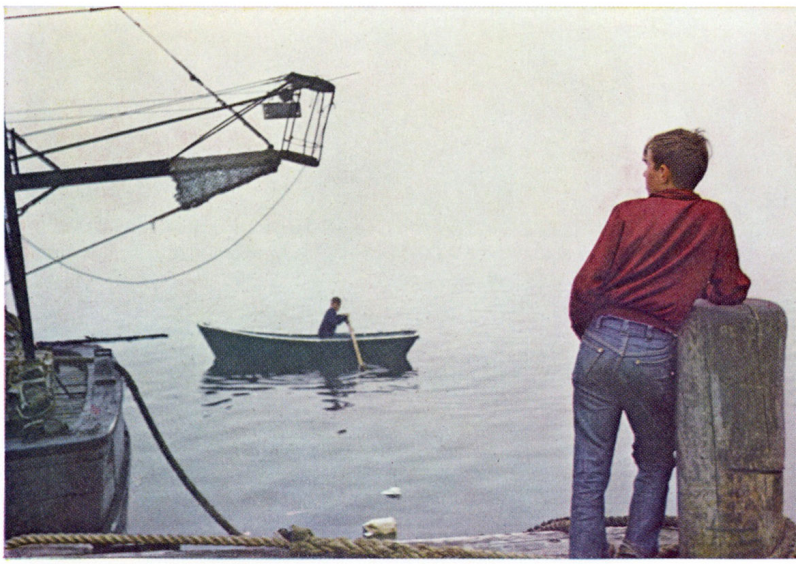
At the same time that hue changes, saturation and brightness may also change. If the light source is warmer than is normal for the film, warm colors tend to become brighter and more saturated, while cool colors tend to become darker and less saturated. As a case in point, if you photographed a girl in a red sweater and blue skirt at sunset, when the daylight is very warm, the red sweater would be reproduced even warmer, brighter, and more saturated than it looked to your eye. On the other hand, the blue skirt would turn out darker and less saturated.

The reverse happens when the light source is cooler than the one the film is designed for. The cool colors tend to look brighter and more saturated in the photograph, while the warm colors tend to look darker and less saturated. If you photographed the same girl as before in the same costume on an overcast day, when the light is cooler and bluer, the blue skirt would tend to appear brighter, more saturated, and an even cooler hue of blue, while the red would appear duller, less saturated, and a cooler shade of red. For further examples of these effects, study the pictures below by Harry Garfield and Alfred Eisenstaedt.

These general principles about the effect of light on the colors in your pictures have many creative uses. Throughout this lesson you will see how members of your Guiding Faculty have applied these principles to make their colors and their pictures more meaningful.

Is there an ideal light?

The light you choose for any particular picture will depend on the specific effect you want. However, there is one type of illumination many photographers prefer for their color work–intense, somewhat diffused light which is not too contrasty. An excellent example of this type of light outdoors is sunlight on a slightly hazy day, when the sun is visible but moderately veiled. In the studio, strong but diffused daylight coming through a skylight, the illumination from a bank of floodlights, or the light from a flash or flood reflected off a white surface will produce a similar effect. Harsh, directional light is sometimes used in color photography, but the light source usually is so positioned that it casts few shadows visible to the camera, or the shadows are opened up by the use of fill-in lights or reflectors. [We will demonstrate these techniques in the lessons on indoor and outdoor lighting.]



Cool, diffused light: Harry Garfield shot the picture above on an overcast day. The bluish, diffused light produces an overall coolness. It emphasizes the blue of the boy's jeans and makes his shirt a dark, relatively unsaturated red. The boy, the center of interest, stands out very clearly against the light, low-saturated background.

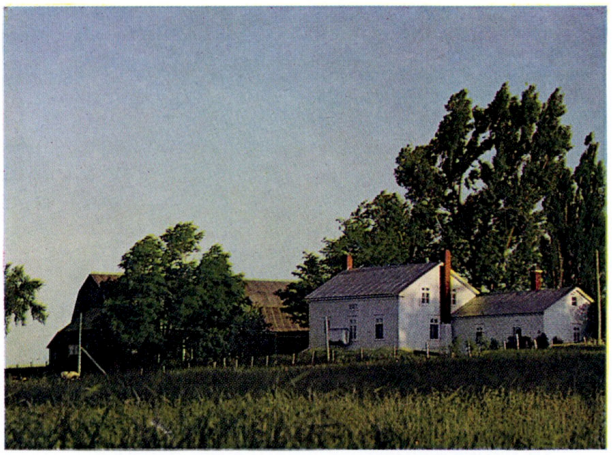
Warm, contrasty light: Alfred Eisenstaedt used the warm, relatively harsh sunlight of late afternoon to take the photograph of Italian movie actress Sophia Loren on the left. Note the warm flesh tones and the highly saturated color in the vibrant, warm pink scarf. Both the sky and the water are a warm blue, tending toward purple. At the same time, because the overall light was warm, the blues are reproduced quite dark.
[Courtesy *Life* magazine, ©Time, Inc.]

Color and time of day

The time of day you select for taking a picture is one of your basic controls when you're shooting outdoors. The light is different at different daylight hours—sometimes it's warmer or cooler, brighter or darker—and each of these differences influences the hue, saturation, and brightness of your colors.

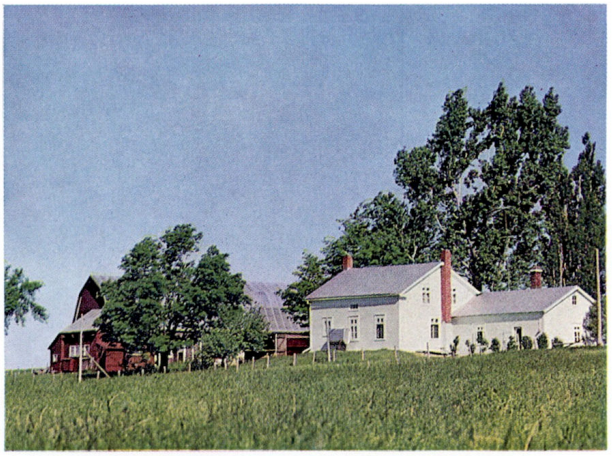
This series of pictures shows you how colors change at various times on a single bright, sunny day. Study them carefully. Don't attempt to memorize all the specific details here, for these will vary with your subject, but do concentrate on the *general overall effect*. Note that the most dramatic and rapid changes in light and color take place at the beginning and end of the day, while the midday changes are more subtle.

Although daylight film is designed or balanced to give you natural-looking color on bright, sunny days from about two or three hours after sunrise to two or three hours before sunset, some of the most dramatic color pictures can be taken outside these limits, during the early and late hours of the day. At these times, the colors may look less natural, but they can give you interesting pictures.

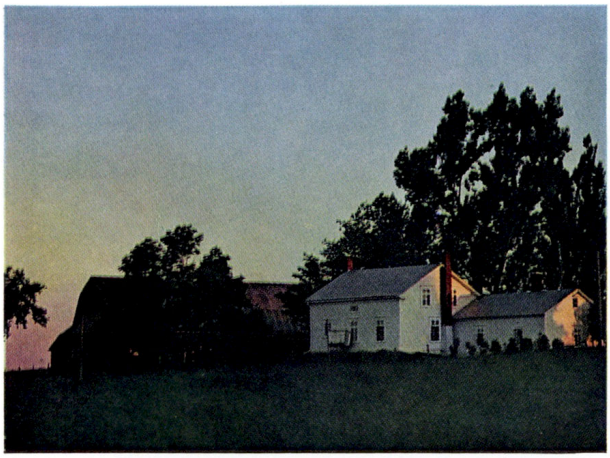


6:10 A.M. The light remains warm, but somewhat less so than before. The sun has now risen high enough so that the rays give the grass a warm, yellowish-green color.

4:50 A.M. There is little variety of color before dawn. Everything is rendered in cool, bluish tones.



9:00 A.M. Here full color is evident. We see the red of the barn and the green of the field. The light is cooler now, too. This is close to the quality of "normal" daylight with which daylight color films give the most accurate reproduction of colors.



5:30 A.M. The warm, slanting rays of the rising sun strike one side of the house and give it a touch of warm color. There is still almost no color in the grass or trees.

NOON: Here is normal bright daylight. It is slightly cooler than it was three hours earlier. The grass and trees appear more intensely green. The overhead sun has washed out much of the color of the roof shingles and the shorter sides of the house are moving into shadow.

2:00 P.M. The light is a trifle warmer [notice that the grass appears more yellow-green] and the shadows on the house have moved slightly. The overall change in light in the last two hours has been very subtle.

8:00 P.M. A hint of the warm colors of the sunset begins to appear in the sky behind the house. The grass and trees are very dark. Notice that the roofs reflect bright, cool light from the sky.

4:00 P.M. As the sun drops lower into its afternoon position, the light becomes warmer again. The house and barn are in shadow except for the strong light striking the roofs. The grass is darker and the clouds have taken on a slightly purple hue.

8:30 P.M. The rich, warm colors of a beautiful summer sunset fill the sky. The sun is down and the light will fade quickly. The grass, barn, house, and trees form a flat black silhouette against the sky

7:40 P.M. The sun is quite low, and the buildings and trees are beginning to silhouette against the comparatively bright sky. The barn is almost colorless and the greens of the grass have become quite dark.

Use natural light creatively

Lighting is one of the most important ingredients of any outdoor color picture, whether it is a landscape as here, a still life, or a portrait. In this set of photographs the light itself– its coolness or warmth and the shadows it creates–is just as basic a part of the composition as the field, barn, house, and trees. Compare the photograph made at 5:30 A.M. and the one made at noon. They are very different in their color and mood–and it is the light that makes the difference. Sharpen your eye for outdoor light. Choose the time of day that will give you the light and color effects best suited to your subject.

Basic color techniques and materials

Now that we've explained and demonstrated some of the basic facts about color and how light affects it, let's take a look at the working methods of color photography–choosing a color film, handling exposure, using filters, and solving special problems. There are many color films and filters for color on the market today, and their performance and the methods of using them may vary somewhat with each. However, the information we give you here is fundamental to all color photography.

Color films

Color film comes in two basic types–*transparency film* and *color-negative film*. Transparency film [also called *reversal film*] produces a positive color transparency or slide which you can project or view by transmitted light. Color-negative film, on the other hand, produces a negative in which the colors as well as the values are opposite what they were in the subject. It is primarily used to make color or black-and-white prints, although color slides can also be made from it.

If you want slides for projection, you'll naturally choose a transparency film. This kind of film is manufactured in a great variety of sizes to fit both large and small cameras, and it ranges from extremely sharp, fine-grain emulsions of slow speed to grainier high-speed emulsions for use in relatively dim light. To make color slides, the individual pictures of 35-mm and roll transparency films usually are mounted in cardboard, metal, or plastic frames, or bound between two sheets of glass. You can view these slides in magnifying hand viewers or project them onto a screen. Large sheets of transparency film–4x5, 5x7, and 8x10 sizes, for example–usually are viewed on a light box, which contains a light behind a sheet of translucent glass. When viewed by transmitted light or projected onto a screen, transparency color pictures often have a brilliance and richness of color that is unmatched. You can also obtain color prints as well as duplicate color slides from color transparencies.

If your main interest is in color prints you would use a color-negative film. The freedom to make either a black-and-white or a color print from the same negative can be a great advantage. For example, a portrait photographer might select color-negative film because he wants to give his customers a choice of color or black-and-white prints. Another advantage of a color negative is that it gives you a considerable amount of darkroom control over the color in the print. Once a transparency film is shot and developed, there is relatively little you can do to alter the results. But in making a color print from a color negative you can use color filters and such creative controls as dodging, printing in, and cropping. [You can also have a color transparency made from a color negative but the quality may be different from what you would get if you used a transparency film.]

Characteristics of color films

Just as with black-and-white films, color films are available in different speeds. Many of the most popular color films are slower than medium-speed films for black and white. Even the fastest popular makes of color film are considerably slower than high-speed black-and-white films. As with black and white, usually the faster the color film the grainier and less sharp the image tends to be. Color films are usually given an ASA exposure index. Use it the same way you use an exposure index for a black-and-white film.

The brand of color film you choose can have a significant effect on the color in your prints. All three dimensions of color [hue, saturation, and brightness] may be recorded differently by various makes of film. For example, some brands tend to give a bright, posterlike reproduction of strong colors, while others provide a more muted effect. Some color films tend to produce colors slightly on the warm side, while others make them more neutral. Many different makes of color film were used by members of your Guiding Faculty to take the pictures we've reproduced in this lesson, as you will see in the technical notes at the end. Which color film or films you choose will depend in part on the color quality you like in your photographs.

Color-film balance

Color-transparency films: One of the important ways that color-transparency films differ from black-and-white films is that they are designed for use with a particular kind of light–such as flash, flood, or daylight. Each is "balanced" to give natural-looking color results when used with the appropriate light source. If used with a different type of light source, the film may record colors so that they look too warm or too cool [unless you correct this effect with filters]. Black-and-white films, on the other hand, can be used with any light source indoors or out.

As we have mentioned, "white" light is not really colorless. Some types of white light look warmer [more yellowish] and some appear cooler [bluer]. Transparency films are available in a number of different types balanced to give natural-looking colors with the principal kinds of white light used in photography.

The warmth or coolness of a light source sometimes is indicated by giving its *color temperature* in *degrees Kelvin* [usually abbreviated as "K"]. For example, photoflood bulbs give 3400K light. The higher the color temperature the relatively cooler the light.

Daylight-type color-transparency film is balanced for the mixture of sunlight and light from the blue sky normally encountered outdoors on a bright day. It can also be used with *blue* flashbulbs and electronic flash, although you may need corrective filters for the most accurate color rendition with electronic flash.

Type A film is designed to give natural-looking colors when exposed with the light from photoflood [3400K] bulbs.

Type B film is balanced for the light from professional studio equipment, which gives 3200K illumination.

Type F film is designed to be used with clear white flashbulbs.

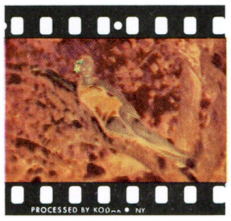
If you find it necessary to use a color-transparency film with a light source for which it is not balanced, you'll need to use the proper *conversion filter*, as we explain in detail in the following pages.

Color-negative films: The situation with color-negative films is a little different from what it is with color transparencies. Each color-negative film is balanced for a particular type of light source, but you can use it with other light sources, too, without putting a filter on the camera at the time you shoot. Any incorrect color rendition that results can usually be corrected by using filters *at the time the print is made.*

However, the above statement holds true only if you are making your own color prints or sending them to a custom lab. It may be a different matter if you are sending your film out for standard machine processing–such as you usually get through your drugstore or camera shop. With standard processing, follow the manufacturer's directions regarding the use of filters with different light sources.

Transparency film

A typical 35-mm cardboard-mounted color transparency is reproduced actual size here. It is a "positive" reproduction of the scene–the colors and values are the same as in the subject. A mounted transparency is called a *color slide* and usually is projected onto a screen for most effective viewing.



Color-negative film

Here is a typical 35-mm color negative of the same subject shown in the transparency. Colors and values are opposite what they are in the subject. The overall orange cast you see is due to the built-in *color masking* of this particular brand of film. All color-negative films do not have masking. A color negative can be used to produce either a black-and-white or a color print, both of which are illustrated here.

Black-and-white print from a color negative

This black-and-white print was made from the color negative at the upper right. Contact printing and enlarging in black and white can both be done with color negatives. If the color negative has masking [like the one shown above], the best prints usually are obtained with a special panchromatic paper. With unmasked negatives, regular enlarging paper–preferably the graded type–also can be used.

Color print from a color negative

This full-color print was made from the color negative at the upper right. The hue, saturation, and brightness of colors can be controlled to a considerable extent by filters and exposure during printing. Cropping, printing in, and dodging are also possible, so a skilled color printer has a wide degree of control over the final results. For details on color printing see your Technical Manual. [Photograph by Richard Beattie]

Exposure and color film

High-contrast lighting

To demonstrate the effect of high-contrast lighting, Harry Garfield placed a single photoflood at a 45-degree angle to the subject. This illumination created strong highlights and intense shadows on the girl's face. Garfield adjusted his exposure to record the brightly lighted flesh tones with normal brightness and saturation. As a result, the shadows went totally black. A transparency film, such as Garfield used here, does not have enough exposure latitude to yield good detail both in very bright highlights and very dark shadows at the same time.

Low-contrast lighting

For this portrait, Garfield added a second light close to the camera, considerably brightening the shadows [without eliminating them altogether]. This reduced the *contrast* between highlights and shadows, so that the film could record rich, full detail in both simultaneously. The result is less harsh, and generally more pleasing for a portrait of a young girl. Some subjects might lend themselves to the contrasty, dramatic lighting used in the portrait at the top, but generally speaking, lower-contrast lighting gives better results with color, indoors or out.

Color films in general have less latitude for exposure errors than most black-and-white films. This is particularly true of transparency films. *Careful, accurate exposure is essential to get the most natural color and the best technical quality from your color films.*

When you shoot in color, it's usually best to avoid high-contrast lighting–that is, lighting that causes very dark shadows and very bright highlights. The exposure latitude of color films is not great enough to record pleasing detail in both when the contrast between them is extreme. [See the portrait on the left for an example of this.] In the lessons on indoor and outdoor lighting we will show you how to reduce lighting contrast.

Of course, you may not always want "natural" color and the highest possible technical quality in your pictures. Just as with black and white, there may be times when you want to overexpose or underexpose deliberately to achieve a special effect. In color photography, exposure can affect all three dimensions of color, but it mainly influences the brightness and saturation of colors. *These two aspects of color often change together as a result of exposure.* If you increase exposure, you increase the brightness of the colors. At the same time you may also decrease their saturation.

Exposure affects color saturation and brightness

Overexposed one stop: This overexposed photograph shows low saturation and high brightness in all the colors. Notice that the blue of the sky, the red of the barn, and the green of the grass are light and pale–too washed-out looking.

For example, normal exposure gives normal saturation and brightness. If you overexpose, the colors will reproduce lighter. Considerable overexposure will give a washed-out look, with the colors both bright and low in saturation. Sometimes photographers use a degree of overexposure deliberately to create a soft, pastel quality in a picture.

On the other hand, if you decrease exposure you always decrease the brightness of the colors on your film. Some colors may also increase in saturation. Thus a degree of underexposure sometimes can be used to get "heavy" [dark and fully saturated] color. The accompanying color pictures of the barn show you the effects of over- and underexposure in comparison to normal exposure.

'Bracketing' your exposures

This discussion brings us to a word photographers often use when talking about exposure. It is *bracketing*. Bracketing simply means making extra exposures at different settings in addition to the normal one. The usual practice is to take two extra shots—one that is slightly *overexposed* and one that is slightly *underexposed*, thus "bracketing" the normal exposure.

There are two good reasons for bracketing. One is to give yourself a choice in color brightness and saturation. You can study all three exposures of the same subject and then select the one that provides the most suitable color results. In practice, color photographers usually limit such over- and underexposure to a change of one third to one half of an *f* stop with color-transparency film, and about one half to a full stop for color-negative film. A second reason for bracketing is that you may not be certain your normal exposure is exactly right. For example, you may not have an exposure meter with you. In this case, over- and underexpose by one half of an *f* stop.

Different films may perform somewhat differently in the extent to which the colors change with changes in exposure. The only way to get a thorough knowledge of the behavior of any color film is to work with it for a period of time. Take pictures of different types of subjects under different lighting conditions, and experiment with bracketing.

Obviously, there are times when it's impossible to bracket. If your subject is moving or you have no control over the shooting situation for some other reason, you may have the time and opportunity to take only one exposure. But with subjects such as still lifes, landscapes, and posed people, bracketing can be a useful technique.

Normal exposure: When the same scene was recorded with a normal exposure, this increased the saturation of the colors in the barn, grass, and sky and gave them a more natural brightness.

Underexposed one stop: The main result is a general darkening of all the colors, with a slight increase in saturation, particularly in the sky.

Filters for color photography

There are several types of filters used in color photography: [1] *skylight* or *UV filters*, which remove excess blue from subjects photographed in open shade or on overcast days; [2] *conversion filters*, which adapt color films to a light source other than the one they were designed for; [3] *light-balancing filters*, which make colors appear warmer or cooler; [4] *color-compensating filters*, which are used in color printing, duplicating color slides, and compensating for slight variations in color-film emulsion; and [5] *polarizing filters*, which darken the rendition of blue sky and reduce glare and reflections. In this lesson we discuss the first two types and demonstrate their effects. You'll find them useful in much of your color shooting. The last three types are more specialized, and we'll take them up in later lessons.

Skylight or UV filters

Probably the single most useful filter for outdoor photography with many transparency color films is the skylight filter. This is a very pale pink filter that slightly warms up the colors in scenes or subjects containing excess blue. For example, when you're shooting on an overcast or rainy day, or photographing a person in the shade under blue sky, your colors may turn out on the cool side. This is particularly noticeable in flesh tones. A skylight filter removes most of the ultraviolet light [which records on film as blue], some of the blue, and a little green, giving you colors closer to "normal."

This filter also helps cut through the bluish atmospheric haze sometimes present in distant views even on bright sunny days, and so it's often used for landscape and architectural shots. Because it requires no increase in exposure and can safely be left on the camera when shooting in bright sunlight, some photographers use it for all their outdoor color pictures.

Filters that produce a similar effect to the skylight are sometimes called UV filters because they also remove most of the ultraviolet as well as some of the blue [but no green] light. However, they are not designed for use with all color films. Follow the film manufacturer's recommendations.

Conversion filters

If you have to use a color-transparency film with a light source for which it is not balanced, you need the proper conversion filter to get good results. This is a tinted filter that warms or cools the light passing through it to match the film's color balance. For example, a bluish conversion filter is used with a daylight-type film to enable you to shoot by 3400K photoflood light; a yellowish-pink filter is used with Type A or Type B films to convert them to daylight use. In some situations conversion filters may be necessary with color-negative films, too. To see the effect of a conversion filter, study the examples on the facing page.

The conversion filters recommended for various light sources are listed in the data sheet that comes with your color film. It's not necessary to own conversion filters to cover *all* possible contingencies. You will probably find it most useful to begin with a conversion filter that enables you to shoot your favorite brand of indoor [Type A or Type B] film by daylight, and one that permits you to shoot a daylight film by an indoor light such as 3200K or 3400K illumination. You can acquire other conversion filters later.

Many photographers standardize on an indoor color film, simply adding the correct conversion filter to shoot by daylight. With most indoor films you will find no appreciable loss of film speed when you shoot outdoors, and the color quality remains good. This method frees you from the need to stock two types of film and keep track of which type is in your camera. However, you may prefer the color rendition of daylight film for outdoor shooting. This is a matter of personal taste that may outweigh the advantages of stocking only indoor film.

There is an important disadvantage to converting a daylight film to indoor use. *Considerable loss of film speed may result.* For example, a brand of daylight color film is rated at ASA 32 when used in daylight. If you use it with photoflood bulbs and the recommended conversion filter, it must be rated at ASA 12. Consequently, a daylight film should be converted to indoor use only as an emergency procedure.

Without a skylight filter: This photograph was taken outdoors on an overcast day, when the light was on the cool [bluish] side. Notice that even the warm yellow of the girl's shirt looks cool and the flesh tones have a bluish cast.

With a skylight filter: A skylight filter was used on the camera for this shot, made on the same film as before. Notice that the filter has warmed up the colors a little, and they look more normal.

Daylight film exposed in daylight

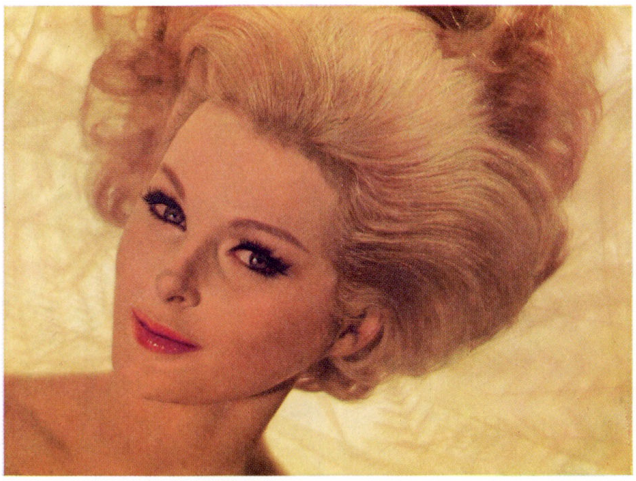
Since the film is properly matched to the light source, we get natural-looking color without a conversion filter.

Type B film exposed in 3200K light

Here the film is properly balanced for the light, and the color rendition is normal without a filter.

Type B film exposed in daylight

When we photographed the same subject on a film balanced for the much warmer illumination of 3200K bulbs, the picture came out much too cool [bluish]. Correction is required to achieve natural-looking colors.



Daylight film exposed in 3200K light

Next, we loaded the camera with a daylight film and photographed the same subject. Because the film is balanced for daylight [which is cooler than 3200K light] the picture has colors that are unnaturally warm.

Type B film exposed in daylight with a conversion filter

By adding a conversion filter, we got this result. The conversion filter warmed up the light to the color balance of the film. The colors look normal and pleasing, although slightly warmer than in the picture made on daylight film. The effect you get with a conversion filter varies with different makes of color film.

Daylight film exposed in 3200K light with a conversion filter

To correct the color rendition, the proper conversion filter was added. In this case, it was a bluish, cooling filter. The result is more natural-looking color [although perhaps not as pleasing as in the Type B picture at the top].
[Above photographs by Richard Beattie]

Two common color problems

Although color can help you make exciting pictures, it can also give you problems. One of the most common of these is *color mergers*, which occur when the subject of the picture merges with the background because both are nearly the same color and brightness. Another common problem is *color reflections*, which are found when the subject of the picture takes on a color reflected from its surroundings. These two problems can be particularly troublesome because we may not even be aware they exist in the picture situation.

To a good extent, the trouble lies in the difference between the way our eye sees color and the way the film records it. Suppose you're looking at a girl in a yellow dress and there is a yellow background behind her. Your eye–assisted by your brain–can usually separate the form of the girl from the background, and therefore you think that the film will do the same. However, you may discover that the two yellows have blended or merged in the print.

In the case of color reflections the problem is even harder to avoid. The reflections may be quite slight, and the eye tends to compensate for these subtle changes in color, so that you actually may not see them before they are recorded on film. The red light reflected on your subject's face from a nearby red wall or the green light reflected from nearby foliage is actually there [as the film clearly shows] but it's easy to overlook it when you take the picture.

The photographs on this page illustrate these common color problems and show how you can solve them.

Color mergers

When you make a color photograph, always be sure there is enough contrast between the color of the subject and the color of the background behind the subject. If both are nearly the same color and brightness, there is danger that they may merge and the picture will be confused. The picture at the left is weakened by the fact that the roses and the background are both red. When we change the background to a blue one the roses stand out much more distinctly. In the third picture the girl's yellow dress tends to merge with the yellow umbrella beside her. The situation is remedied in the next picture merely by changing the girl's position so that she is seen clearly against the blue background. The subject will stand out best if the background color is complementary.

Color reflections

When light is reflected from a surface, *the light will be the same color as the reflecting surface.* In the picture at the far left, the girl has red light on her face, reflected from a red wall near by. The reflection was eliminated by having her turn away from the wall and changing the camera angle, as shown in the second picture.

Advancing and receding colors

Some colors seem to advance–to thrust themselves forward –while others appear to recede. This effect can be useful to you in composing color photographs indoors or out.

In general, warm colors–like reds, oranges, and yellows –give the illusion of being closer to us than others and therefore are called *advancing* colors. Cool hues–like blues, greens, and purple-blues–seem to be farther away and therefore are called *receding* colors.

Strong, fully saturated colors of any hue appear closer than do pale, washed-out colors of the same hue.

This illusion of advancing and receding colors is based on the way we see colors in nature. The hues which we see close up usually are warmer and more fully saturated than those in the background because haze and atmosphere increase with distance, making the faraway colors appear cooler and less intense.

You can emphasize this effect, and give your color pictures an added feeling of depth, by composing with an eye to advancing and receding colors. Outdoors, include a warm, rich color in the foreground to contrast more strongly with the cooler, paler colors that nature is likely to provide in the distance. Indoors, try to arrange things so that warm, strong colors are close to the camera and cool, low-saturation colors are in the background. Sometimes you may do this by your choice of camera position; at other times by moving a person, prop, or piece of furniture to get the effect you want.

In this photograph of a landscape of Provence, France, Irving Penn has achieved a strong feeling of distance through the sharp contrast between the advancing and receding colors. The warm colors in the fields seem to advance toward us, while the cooler tones emphasize the remoteness of the hills in the background. Note the low saturation and marked grayness of the colors in the far distance.

In this interior color shot by Ezra Stoller, the use of advancing and receding colors strengthens the feeling of three-dimensional space. The warm, brownish-red chair, prominently placed in the foreground, is an area of advancing color. The intense, fully saturated hues in the rug also seem to thrust forward. On the other hand, the cool hues of low saturation in the background seem to recede. Notice that the bricks on the wall at right are warm inside the room close to us, but are cool at the far end, on the other side of the glass partition. This transition from warm to cool intensified the sense of depth that is suggested by the converging perspective lines of the wall. [Courtesy Henry End Associates]

The emotional effect of color

Colors have a strong effect on our emotions. They can help create almost any kind of mood. They can make us feel cheerful or depressed, excited or relaxed, warm or cold. In the color photographs you make, you can use color creatively to affect the emotions of those who view them.

Colors gain much of their emotional power through the things we associate them with. Some of our most basic color associations come from nature.

Red is associated with fire and heat. It is the most stimulating of all colors and commands the attention. It may suggest vigor, excitement, or danger.

Blue is associated with the sky and water, and with coolness. It is a restful color and tends to soothe or relax us; it may depress us, too. Blue may suggest peace, quiet, and distance [remember that distant objects also appear bluish to the eye].

Green is the color of leaves, grass, and plants. Through this association it suggests growth and nature. It is also the color of the sea and as such it is a refreshing, cooling color.

Yellow is the color of the sun. It is associated with warmth, ripeness, wealth, and a feeling of well-being.

Purple is the color of the sky at dawn or dusk, of distant mountains, and of certain fruits and flowers. It is not as common as other colors in nature. We associate purple with magnificence, romance, and mystery.

Black and white, while not literally colors, have an effect on our emotions. They have age-old associations with night and day. White suggests freshness, purity, and clarity, while black suggests evil, mystery, and death.

Brightness and saturation, in addition to hue, also contribute to the way color affects our emotions. Generally, bright colors suggest gaiety, lightness, and happiness, while dark colors are more somber and suggest heaviness, sadness, and dignity. Highly saturated colors are more dramatic and assertive than colors of low saturation.

The variable effect of color

The emotional effect of color is not always so simple or direct as our discussion may seem to imply. The feeling a color gives us depends not only upon the color itself but also upon the subject with which it is used, or the situation of the viewer. For example, on a brilliant, hot day, a pool of blue water will look cool and wonderfully inviting. The same blue pool, on a cold gray day, will seem chilly and uninviting. The warm red of a fire on a hot day may make us feel stifled, but the same red on a cool, gray day can make us feel cozy.

Often, you can show a subject in an unfavorable light by deliberately using colors that are not typical of it. Imagine a good picture of a steaming cup of coffee with a piece of cake beside it. Also imagine this same subject illuminated by green light. No matter how appetizing the subject is in reality, the picture would look unnatural or unpleasant. Similarly, a person's face bathed in blue, green, or even yellow light of a certain shade can suggest sickness or horror.

Applications in other fields

Creative artists in all fields have always been aware of how color can be used to evoke mood and emotion. In painting, for example, color is one of the basic tools with which the artist expresses himself. Much of his success depends upon the skill with which he selects, arranges, and combines his hues to influence the feeling of the viewer. You, as a photographer, can learn a great deal about color by observing the things that the great masters, old and new, have done with it. Trips to art museums and the study of art books can help develop your ability to use color creatively in photography.

In the theater, you see color used in lighting and costumes, for atmosphere and setting–even for characterization. For instance, pink may be used for scenes of sentiment and romance; a green light for ghostliness and horror; blue to suggest moonlight and evening, or a pensive mood. Bright, warm colors in light and costumes are used to help create a mood of excitement and gaiety, and cool, grayed colors for a mood of stillness and despair. Movies use colors in the same way, and so does color television. By noticing how color is employed in all these media, you can increase your ability to see and use it creatively.

In many areas other than the arts, color is frequently used for its emotional effects. In hospitals, rooms are painted in soothing colors where patients are to convalesce or wait, and in more stimulating colors where they need to be cheered and encouraged back into activity. Factories and offices are often painted in colors that help to produce a feeling of well-being in employees. In the fashion world, a particularly appealing color can sell a dress immediately, while the same dress in a less enticing color will not move off the rack. In advertising, colors are carefully selected to make products look attractive to the prospective buyer. The colors used in travel folders may affect us so strongly that we yearn to visit the far-off places they picture.

Weather also affects us with its shifting colors. A clear day in which all the colors of earth and sky are warm and brilliant can make us feel optimistic and gay. A dark, somber, overcast day with little color can lower our spirits. These reactions can be put to good use in color photography. By using the varying colors of the seasons, you can subtly evoke the hopeful feeling of spring, the finality of fall, the bleakness of winter, or the laziness of summer in your photographs.

Before you shoot

Each time you make a color photograph, you should look at the subject in terms of the emotional effect of its colors. Before you make the picture, ask yourself these two questions:

1. Are the colors my camera will record appropriate to the subject and to the emotional response I want to produce in the viewer?
2. How can I control the colors, if necessary, to make the photograph express my point of view more strongly and clearly?

Often, when you take a photograph, you may not have complete control over the colors in the scene. In fact, unless you are working in a studio, total color control is seldom possible. Nevertheless, by keeping in mind the mood you want to create in a picture and by applying the color techniques described in this lesson and later in the Course, you will find that you can use color in a highly creative, effective way. It's important, however, that you don't use your control over color simply to make the picture more colorful. Color should make a positive contribution toward what the picture has to say.

This winter photograph by Alfred Eisenstaedt, with its cold blues and sparkling whites, evokes the bright, icy mood of the scene. One of the most basic ways in which color expresses a feeling is through its identification with temperature.
[Courtesy *Life* magazine, ©Time, Inc.]

In this advertising photograph and the one below, Bert Stern has used an overall color scheme to help express a mood appropriate for the product shown in the picture. Here the warm violets and deep purples of the sunset sky evoke a mood of romance and mystery. This, with the reflections and the out-of-focus silhouette of the man in the background, dramatizes an otherwise commonplace subject–a cocktail. The effect of the colors and other visual elements in the picture is to suggest the rare and wonderful–to hint at imminent adventure. This was exactly Stern's purpose: to create an aura about the product rather than to present it literally.
[Courtesy Smirnoff Vodka]

Bert Stern made this picture for a woman's shoe advertisement. The use of cool, restful greens just beginning to be touched by the warming light of early morning gives a feeling of peace and contentment which perfectly supports the composition and subject matter. Of course, the imaginative touch that captures our attention is the startling, almost surrealistic effect of the sleeping woman in the midst of this quiet, pastoral scene.
[Courtesy I. Miller and Sons Co.]

Changing the overall color in a photograph

Sometimes you may want to alter the overall color of a photograph to produce a particular mood or effect. The result may be "unrealistic," but it can be very effective because of the emotional impact of the colors.

Basically there are four ways to alter overall color. You can change light itself, use filters on the camera, use filters during the making of the color print, or deliberately "mismatch" the film and light source.

1 Changing the color of the light: You can change the color of the light itself by placing colored filters or theatrical "gels" [transparent colored gelatin or plastic sheets] in front of the light.

2 Using filters on the camera: Light-balancing filters can be used to give a warmer or cooler result than normal. Number 82 light-balancing filters are *cooling* [bluish]; number 81 filters are warming [yellowish]. They come in varying strengths.

Color-compensating or CC filters allow considerable scope for imaginative use of color. They come in various pale densities of red, green, blue, magenta, yellow, and cyan. These and light-balancing filters are described in your Technical Manual.

For extreme, unusual effects, you can use filters designed for black-and-white photography. For example, a medium yellow filter, used with color film, will give you a yellowish picture. A green filter will give you a greenish cast, etc.

3 Mismatching the film and light source: You can create unusual color effects by exposing a film to a light source for which it is not balanced. As you have seen, daylight transparency film shot by 3200K light will produce very warm results, while a Type B film exposed in daylight produces pictures with an overall bluish cast. Normally, this is not desirable, but it may be useful for special effects.

4 Color filters during printing: When you make a color print from a color negative, you can alter the color with CC filters. The effect can be similar to what you would get with the same CC filter on the camera. To use this control, of course, you must do your own color printing or work with a custom printing lab.

In the accompanying illustrations we show you some of the effects you can obtain by using color filters during printing. Below is the "straight" color photograph by Richard Beattie. Compare it with the pictures on the facing page and observe how the change in the overall color of each picture changes the impression it creates.

A filter during printing produced overall warm hues. The color creates a feeling of warm, sunny, late afternoon. You can achieve a similar effect by putting a warming filter in front of the lens when taking the picture.

Another filter gave hues we do not commonly encounter in nature. The effect is one of fantasy, of dreamlike unreality. CC filters, because they are available in a variety of hues, are particularly suited to creating unusual color effects.

Here a filter produced overall cool, bluish tones. The effect suggests a cool, crisp time of the year. An indoor transparency film, used by daylight without a conversion filter, might produce a similar bluish effect.

The filter used for this print produced an overall color that suggests the reflected light of a flaming sunset. The photographer could have achieved a similar effect by using a red filter on his camera when he took the picture.

Color in composition

You have already seen how color can be used to create mood and strengthen the emotional meaning of your pictures. But color is also a basic element of composition–just as important as the elements of picture area, value, lines of direction, and depth which you studied in the lesson on composing your photographs.

As a compositional element, color can unify a picture and hold it together. It also can attract the viewer's eye to the center of interest of the picture. Most successful color pictures, whether they are planned or candid, do use color in an organized way. They have a *color scheme*. Either consciously or unconsciously the photographer has selected colors that work together to produce a certain effect.

In composing in color, and in establishing a color scheme, you have two basic decisions to make. First, you must decide *what colors you will include* in your picture. You can determine these by your choice of subject, props, background, camera viewpoint, and moment of exposure. Second, you must decide *how you will record these colors* [and possibly modify them] by your choice of film, lighting, exposure, filters, and focusing.

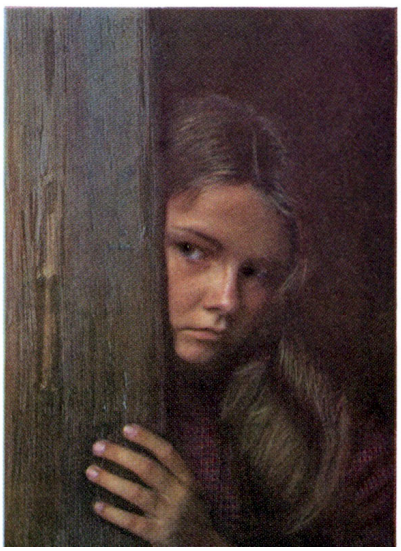
On this and the following pages we show you how members of your Guiding Faculty use color in a creative way. Study the pictures for the principles of composition and color control that they demonstrate, and use these fundamentals in your own color shooting.

Muted color schemes

You don't need bright, fully saturated colors to make a good color picture. In fact, some of the most effective color photographs use soft, muted colors which are present in the subject matter itself or are produced by the lighting. The use of muted colors doesn't necessarily mean that *fewer* colors are included in the picture. It simply means that the colors that do appear are less saturated and brilliant. Even within a color scheme of this type, there is room for some contrast of color, to add variety and emphasize the center of interest.

This photograph, taken by Victor Keppler on the West Indian island of Antigua, uses soft, muted grays, blues, browns, and oranges to suggest the peace and quiet of a tropical sunset. This mood is enhanced by the long sweep of the horizon line, broken by the peak of the wave in the foreground.
[Courtesy Canadian Schenley, Ltd.]

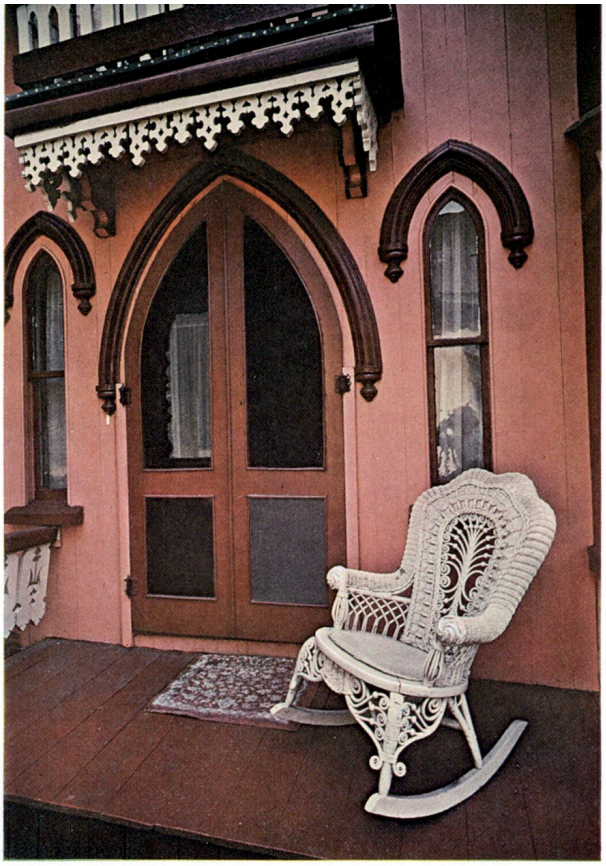
Muted color is not just suitable for quiet subjects. This dramatic picture, taken by Joseph Costa, shows a DC-4 thrusting sharply upward, boosted by jets. The plume of white smoke stands out against the dark purple blues of the hills and the ominous bluish grays of the clouds. The muted warm colors in the strip of ground at the bottom contrast strongly with the cool hues in the background. If the picture had been taken in black and white, this would have been recorded as just another area of gray and stood out less. In color it provides a clearly defined base from which the plane and smoke soar.
[Courtesy New York Sunday *Mirror*, ©1962, King Features Syndicate, Inc.]



This somber but compelling portrait of a young girl by Philippe Halsman is composed predominantly of dark muted hues. The only light, warm colors occur on the girl, the picture's center of interest.
[Courtesy *The Saturday Evening Post*, ©1962, The Curtis Publishing Co.]

Related color schemes

Just as highly saturated colors are not essential for a good color picture, neither is a wide variety of hues. The photograph which contains "all the colors of the rainbow" is not necessarily better than one which is limited to a few related colors. See how effective these pictures are –although the photographers have restricted their use of color to hues which are fairly close to one another on the color wheel.



The soft, slightly cool light of open shade gives a gentle quality to the related pinks and violets of this Gothic American porch photographed by Alfred Eisenstaedt. The quietness of the subject matter is perfectly expressed by the equally restrained use of color.
[Courtesy *Life* magazine, ©Time, Inc.]

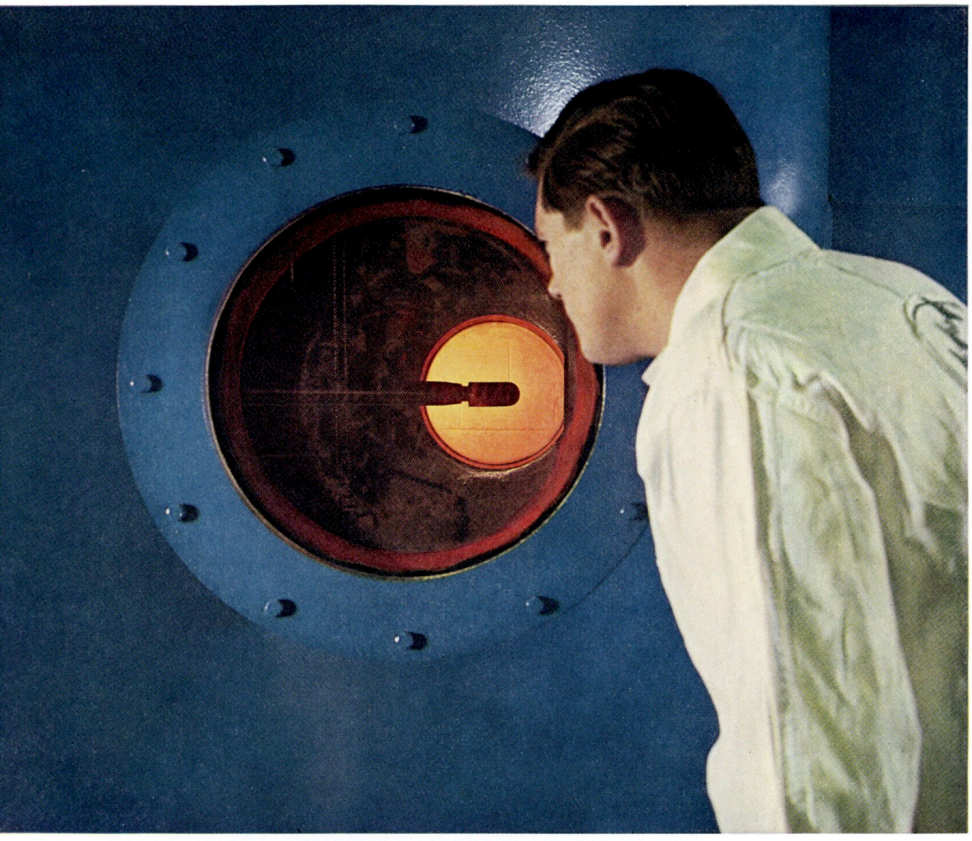
In this still life by Irving Penn, which represents a spilled handbag at the theater, we see just a very few related colors on the warm part of the color wheel–golds, yellows, and browns. Note the use of the pink pill and the pink capsule as individual accents within the related color scheme. The black shoe and pants leg are a very strong compositional element, as are the cigarette and the white face of the watch. Both black and white often can be used effectively, setting off colors and making them look brighter and more intense. Although the colors here are very limited, they appear in a wide variety of materials with different textures. This textural quality adds considerably to the interest of the picture.
[Courtesy *Vogue*, ©1947, Condé Nast Publications, Inc.]

Richard Beattie made this picture for a cigarette advertisement. From the different shades of blue and blue-green in the water to the bathing suits, the colors were carefully selected for their close, harmonious relationship. The photographer used the same cool, fresh colors found in the cigarette package, which was reproduced with this illustration.
[Courtesy Newport Menthol Cigarettes, P. Lorillard, Inc.]

Contrasting color schemes

Color contrast is one of the most important means for adding excitement to a picture. The contrast between colors is greatest when these colors are complementary to each other, such as yellow and blue or red and green. Complementary colors enrich and accentuate each other–green looks greener next to red, orange seems even more intense against a blue background. Just a small touch of a color on a contrasting background will stand out and attract our attention. The combination of contrasting, complementary, or warm and cool colors can produce a photograph which is vibrant and alive.

Richard Avedon used a contrasting color scheme for this photograph, which ran as a fashion magazine cover. To emphasize the reds in the toe and heel of the shoe, he placed blue-green and blue lights in the background and reflected them off the pavement. These cool, contrasting colors made the red seem brighter and warmer, and created a lively, festive effect. The relatively slow shutter speed of one second registered the moving foot as a blur and the shallow depth of field softened the background. The strong diagonal line of the leg suggests motion. Rather than being a static fashion shot, the picture is full of vitality and movement created by the use of color and other compositional elements as well as camera techniques.
[Courtesy *Harper's Bazaar*]



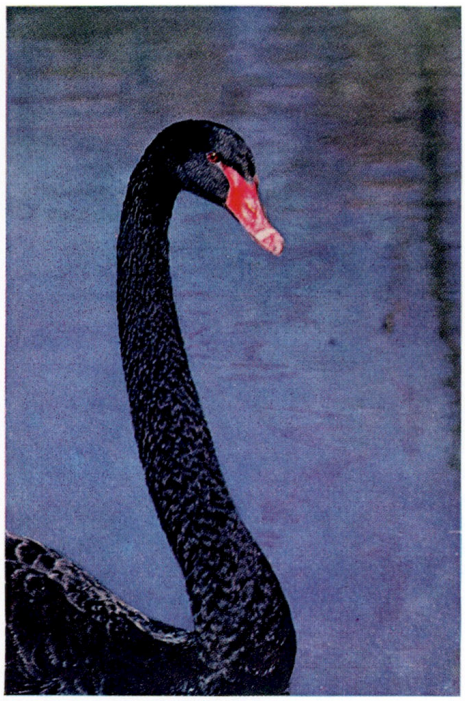
This industrial photograph by Arthur d'Arazien owes a good deal of its impact to the bold contrast and high saturation of its blue and orange. The orange looks doubly intense because of the black and blue around it. The subject, a highly scientific one, seemed to hold little interest or meaning for the general viewer; how could it be made into a successful picture? D'Arazien did it through the use of this bull's-eye of colors, simply and boldly composed.
[Courtesy Republic Aviation Corp.]

Color accents

You can use a spot of contrasting color or more emphatic color to add interest or vividness to a photograph or to direct attention to the center of interest. Just like values and lines of direction, a color accent can guide the viewer's eye. In each of these pictures, there is a spot of bright color which attracts our attention. Cover up this spot and you will see immediately that the photograph loses much of its impact.

A color accent can be "soft" or "loud," depending on the mood of the picture. It can abruptly command the eye to travel to a certain point or gently lead it there. This Irving Penn photograph of a mother and child uses extremely subdued color throughout, except for the accent of the mother's lips. Here the accent is a *related* rather than a contrasting color–a touch of red against warm flesh tones. Being the brightest, most saturated area of color in the picture, it strongly attracts attention. The picture expresses a gentle emotion, and the use of a related color accent is quite in keeping with it.
[Courtesy *Vogue*, ©1950, Condé Nast Publications, Inc.]

Alfred Eisenstaedt made this picture when photographing a rain forest of South America for *Life* magazine. The brown leaves might have been monotonous by themselves, but by including the striking blue color accents Eisenstaedt was able to suggest the strange beauty which can be found in the jungle, even underfoot on the forest floor.
[Courtesy *Life* magazine, ©Time, Inc.]



This photograph of a black swan by Alfred Eisenstaedt would be quite prosaic in black and white. In color, however, it becomes quite dramatic, with the red accent of the bill standing out sharply against the cool blue of the water. Nature is full of exciting color combinations like this–always be on the alert for them.
[Courtesy *Life* magazine, ©Time, Inc.]

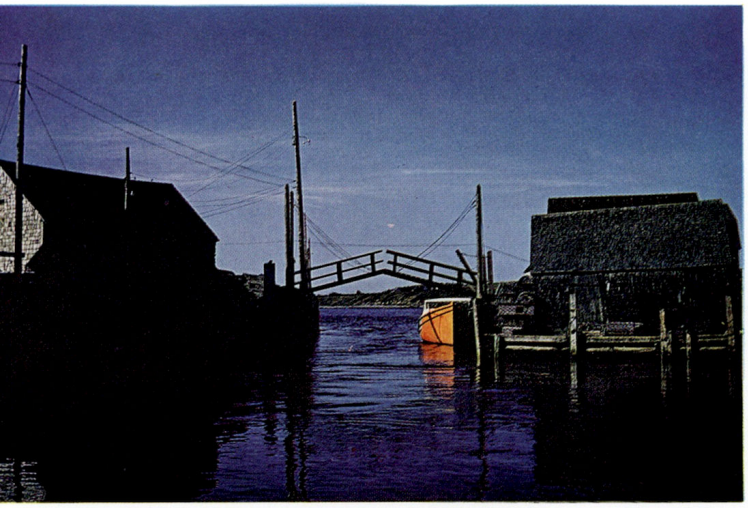
An unusual use of a color accent occurs in this advertising photograph by Richard Beattie. The rich, red catsup pouring from the neck of the bottle is the real subject; Beattie has emphasized it by placing the pile of green peas behind it to set it off. Note that the photographer used selective focus to concentrate interest on the catsup, while leaving the peas out of focus.
[Courtesy Stokely-Van Camp, Inc.]

Using underexposure and overexposure creatively

Even more than with black and white, it's important that you expose color film–especially color-transparency film–with care. However, there may be times when you want to deliberately underexpose or overexpose for creative purposes, as was done in the illustrations on this page. For example, overexposure usually gives you a high-key rendition of hues, with increased brightness and often with lowered saturation, as in Irving Penn's picture of a woman playing cards at the beach. Underexposure, on the other hand, decreases brightness and sometimes increases saturation for a richer, low-key effect as in Ezra Stoller's photograph of sculpture or Harry Garfield's seascape.

Bracketing offers you possibilities for using exposure creatively. If the situation permits, in addition to your normal exposure, take one or more pictures in the direction of overexposure, and one or more in the direction of underexposure. Then pick the shot you like best. In general, color-transparency film withstands underexposure better than overexposure, while color-negative film–although having more latitude overall–withstands overexposure better. As with any creative technique, you'll need to experiment to discover the result you like.

What could have been a conventional architectural picture is given a dramatic treatment in this photograph by Ezra Stoller. The monolithic shapes of the modern sculpture in the foreground tower over the building in the background. The picture, deliberately underexposed by the fading blue light, emphasizes the dark stone shapes against the cloudy sky. A few lights in the building add touches of warm color. [Courtesy Connecticut General Life Insurance Co.]



Harry Garfield deliberately used the technique of underexposure to obtain highly saturated colors and provide a strong color accent in this photograph. Notice that all the colors, even the sky, are underexposed to some degree, but the shadows have gone completely black and now function in the composition as forms which lead the eye toward the bright yellow hull of the boat. The picture was taken by the warm light of late afternoon.

Irving Penn's picture of a glamorous woman playing cards demonstrates overexposure used to brighten and decrease the saturation of the colors, giving the picture a feeling of intense light as encountered at the beach. Red and green are main elements in the color scheme–but instead of producing the vibrant effect that complementary colors often create, the hues are muted and softened by the overexposure–creating a bright, feminine effect. [Courtesy *Vogue*, ©1954, Condé Nast Publications, Inc.]

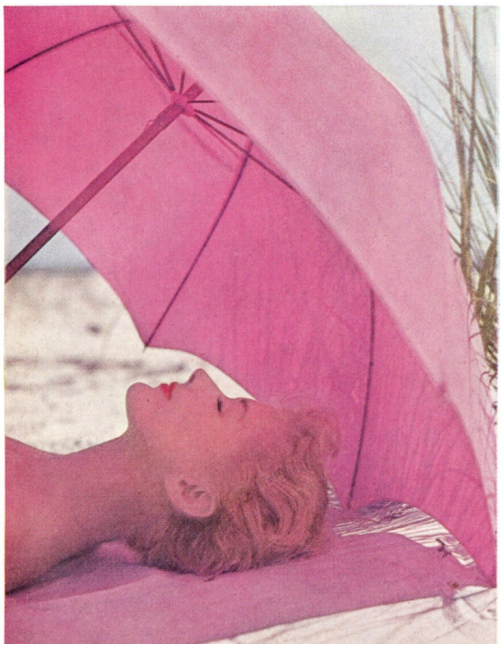
Offbeat color

Color is one of the most powerful means you have to make your pictures startling and original. Rather than using it to subtly evoke mood or make the picture seem more true to life, you can give it a leading role–use it in a striking, offbeat way, so that it becomes as important as the subject of the picture itself.

The use of color to shock or amaze because of its unexpected qualities is common in many types of pictures. It is especially popular in fields such as high-fashion photography and advertising illustration, where the purpose of the photograph is often *to command attention*, as much as it is to report on what the photographer saw.

There have been many color pictures taken of streets at night, but Arthur d'Arazien has given a new vision of the subject in this one. The offbeat color effect was produced completely in the camera, which remained in exactly the same position on its tripod throughout. First d'Arazien made an exposure of one second, at dusk, with the lens in focus and everything sharp. The purpose of this first exposure was to capture detail in the street and sidewalk areas while there was still some light from the sky. About an hour later, when the scene was completely dark except for the street, store, and car lights, he threw the scene out of focus and made a second exposure on the same piece of film. The moving lights of the cars were recorded both blurred [because out of focus] and as streaks [because of their movement during the long exposure]. These streaks and blurs are superimposed over the first, sharply focused image.

Rather than use a standard color filter on his camera or in printing his picture, Irving Penn ingeniously made an important element in the scene serve as a filter. The light passing through the umbrella colors the illumination falling on the face of the model and adds an attention-getting touch.
[Courtesy *Vogue*, ©1950, Condé Nast Publications, Inc.]



Richard Avedon altered the color of various light sources to make this picture–an illustration for a new lipstick and matching nail polish. He used a bluish-green filter over a light pointed at the background, and green filters on lights pointing at the girl. A spotlight was played on the sequins to give them more sparkle, and one unfiltered light was placed in front of the girl far enough away to soften–but not completely wash out–the green illumination from the filtered lights.
[Courtesy *Harper's Bazaar*]

Color control in a studio: Richard Avedon photographs Marilyn Monroe

One of the best ways to develop your sensitivity to color is to see how outstanding photographers use it. The photographs on these two pages are representative of what a creative photographer can do when he has almost complete control of his shooting situation. Naturally, most situations you shoot will be less controlled than this one, but the principles of selecting and combining colors that Richard Avedon used here can be applied in your own color photographs. The pictures [shot on assignment for *Life* magazine] show Marilyn Monroe in the role of five famous sirens of the screen.

In making these photographs Avedon was able to choose props, costumes, background, and lighting. He was able to direct his subject and to shoot many pictures until he captured exactly the moment he wanted. Avedon's imagination and creativity plus Marilyn Monroe's glamour and ability as an actress added up to a gay and memorable set of color pictures.

Avedon's problem was to evoke, through all the means available to him, the aura of each of these famous actresses. In each picture, he made use of color schemes of related colors. In some he limited himself to only one hue [though of different brightness and intensity] except for one or two accents in a contrasting color. In all of these imaginative pictures, Avedon carefully planned the colors and composition to create the mood of the situation and character portrayed. His approach varied with his subject, ranging from the subtle simplicity of the Jean Harlow picture to the ornate, exotic treatment of the Theda Bara shot.

Clara Bow, the red-haired "it" girl of the 1920's, is portrayed by Monroe and Avedon in a red costume, surrounded by balloons of white, pink, and red. The related hues of red and pink are slightly cool, due to the lighting, and this coolness is carried through in the blues and blue-grays of the 1920's background. The actress's costume is the largest, warmest area of red, and her hair is a warm red, too. Note how these reds stand out against the cooler backgrounds. A contrasting color accent is provided by the green bottle from which the flapper exuberantly pours champagne.

Theda Bara, sultry vamp of the silent movies, is suggested with the help of related warm colors in the exotic costume and props. The light tones of the skin show up very clearly against the darker, patterned tiger skin and background. The brightest accents of yellow are on the actress's jewelry. Her head, the center of interest, stands out strongly because of the contrast of the intensely black hair with the light gold turban.

Lillian Russell, singing toast of the Gay Nineties, is portrayed by Marilyn Monroe seated on a replica of the famous gold-plated bicycle given to Russell by Diamond Jim Brady. The period is known as the Mauve Decade, and Avedon chose a related color scheme of soft lilacs, purples, and blues. The only note of contrast is in the bicycle and in the actress's hair, where it is stronger. The background is reminiscent of a theatrical setting of Lillian Russell's era.

Jean Harlow, platinum-blonde film star of the 1930's, is acted by Monroe in a nearly all-white picture. Harlow's platinum hair provided the color theme for the picture. Against the cool white the skin tones are just warm enough to be emphatic. Notice the two strong accents, Monroe's lips and the open mouth of the dog.

Blue seemed the natural choice for Marilyn Monroe's portrayal of Marlene Dietrich's cabaret scene from the 1939 film classic *The Blue Angel*. [The title of the film inspired the color scheme.] Avedon chose a blue costume, blue settings and props, and blue light, which suggest a backstage scene in a nightclub. The greatest contrast is between the blue costume and light flesh. Everything else is subdued.

Color control away from the studio

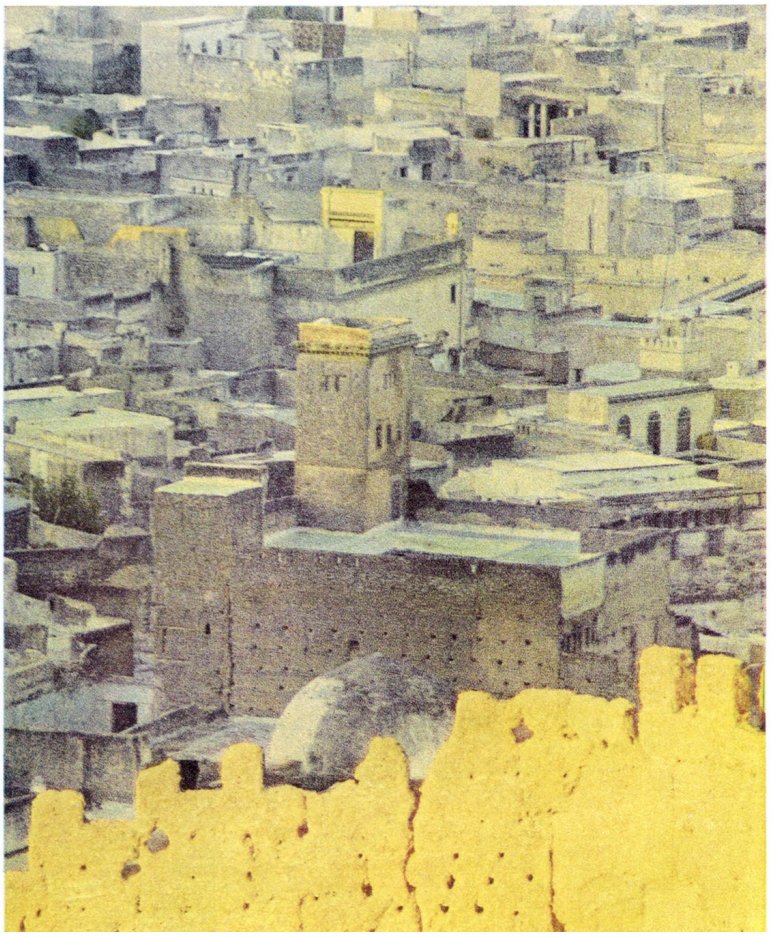
Outdoors and when shooting unposed subjects, you have less direct control over color than you do in a studio, where you can choose and arrange models, props, backgrounds, and costumes as Richard Avedon did in his pictures of Marilyn Monroe. Away from the studio, it is usually more necessary to find a good color subject that already exists. Then you compose it effectively by your choice of angle and timing, by use of different films and filters, by exposure, focusing, and other camera controls. The result can be just as creative in the sense that every picture you take reveals your approach as a photographer –your personal way of seeing and interpreting your subject.

The accompanying photographs demonstrate some of the ways you can control color when you shoot outdoors. Alfred Eisenstaedt's four pictures of a country church show how choice of angle and shooting distance can produce a variety of color compositions with the same subject. Which picture of these four is "best"? That is a matter of taste and the purpose for which the picture is intended. The important point is to understand that changes in camera position can alter color composition without your actually touching the subject itself.

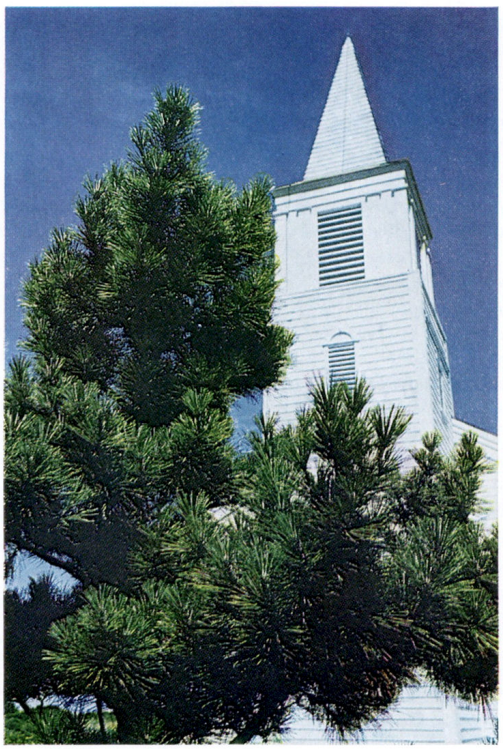
The two color pictures by Arthur d'Arazien utilize timing and exposure to dramatize a landscape. Irving Penn's view of Fez, Morocco, reveals the photographer's sense of color at work in composing a subject over which he had no direct control but which he still treated in a very imaginative way.

A straightforward shot of this country church, taken by Alfred Eisenstaedt, shows it pure white against bright blue sky with a predominantly green foreground dotted with bright yellow flowers. However, the photographer did not stop with just one picture. Instead, he explored the effects he could get from different camera positions.

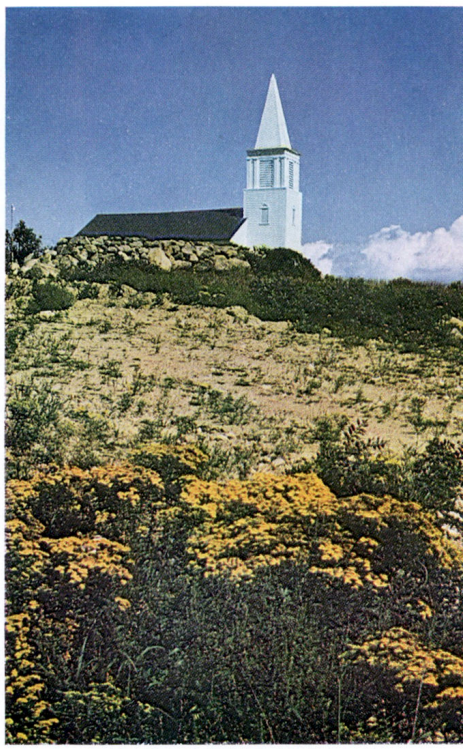
Careful choice of camera angle and time of day gave Irving Penn this magical view of Fez, Morocco, just as the last rays of the dying sun were falling brightly golden on the wall in the foreground and on the tops of buildings beyond. These bright, heavily saturated areas of color are the most compelling details in the picture. They stand out strongly from the softer, less saturated surrounding colors, and lead the viewer's eye into the picture. Penn shot the scene on very small-size film, then had it copied and enlarged to emphasize the grain pattern. The result is not a literal record of the city, but an expression of the photographer's response to its mystery and beauty. [Courtesy *Vogue*, ©1952, Condé Nast Publications, Inc.]



By moving farther back and shooting as clouds drifted across the sky, Eisenstaedt produced an entirely different color composition. Here the church is only a small white accent in the far distance. The emphasis is on the blue sky and the cool light grays of the clouds, which contrast with the predominantly warm yellows and browns of the land.



Shooting from a low angle and including an evergreen tree in the foreground to frame the church steeple, Eisenstaedt composed this picture primarily in white and dark, intense blues and greens. The vivid blue background and the sharp lighting emphasize the austere lines of the church.



In still another variation, Eisenstaedt found a camera position that placed greater emphasis on the yellow masses of wildflowers and the sand in the foreground. The church still stands out prominently against the blue of the sky, dominating the contrasting color scheme.
[Courtesy *Life* magazine, ©Time, Inc.]

These two different versions of the same scene show how you can control color through the time of day you choose for shooting and the use of multiple exposures. The subject is a molybdenum plant in Colorado.

For the picture at left, d'Arazien set his camera on a tripod and used a wide-angle lens to get a broad, overall view of the buildings, surrounding snow-covered hills, and the dark foreground trees. He took the picture on daylight film at dusk as the sun's last rays illuminated the buildings. The result is a soft, pale, bluish rendition of the snow, in subtle contrast to the pale yellow of the sunlight.

For the picture at the right, the photographer made three exposures on the same sheet of film. First he made an underexposed shot at late dusk before the lights were turned on. This recorded the snow with a dark, heavily saturated twilight blue. He made a second exposure after the lights came on. As recorded on daylight film, they are dazzling and warm, and contrast sharply in hue and brightness with the surrounding dark, cool colors. Finally, he made a third exposure while an assistant drove a car back and forth along the road in the foreground to register the headlights as motion streaks.
[Courtesy American Metal Climax Co.]

Realistic and interpretive color photography

Broadly speaking, there are two ways you can use color in photography–in a *realistic* way or an *interpretive* way. A photographer who uses the realistic approach tries to produce colors in his pictures that closely resemble the colors in the subject itself. A photographer who uses the interpretive approach may deliberately change or exaggerate colors to create a mood or other special effect.

Both approaches have their advantages. Sometimes one is more appropriate than the other, depending on your subject, the purpose of the picture, and what you are trying to communicate. There has been a great deal of debate and confusion over these two uses of color. Of course, the final decision of how you use color in any picture is up to you. But perhaps we can clear up some misunderstandings and help you make better-informed judgments about which approach is more suitable for different purposes.

Realistic color

Realistic color is what most people want when they shoot a color picture. They want the colors in the photograph to reproduce as exactly as possible the colors in the subject.

This "straight" use of color is appropriate when you wish to make an accurate record of the subject–for example, to show the rich, subtle reds of a rose for a flower advertisement, or the exact shade of yellow of a new fabric. A photojournalist who documents an event, a traveler shooting a foreign scene, or a portrait photographer portraying a subject all might want realistic color to show other people "the way it really was." Some of the projects and assignments you do for this Course will require you to record colors as exactly as possible.

Achieving realistic color may not be quite so simple as it sounds. It involves judgment and personal taste on your part–and on the part of people who look at your pictures. Few people are trained to see color in a perceptive way, or to remember accurately what they've seen. They may think of a red apple as being redder than it actually is, or the blue sky as a more intense blue. Some people find a slightly cool effect more pleasing and realistic in color pictures; others prefer a slightly warmer effect.

What should you do? Please yourself–and your client, if you are shooting on assignment. Here is a brief list of pointers to help you in achieving natural-looking color:

1. Choose a color film or films to suit your personal taste. This is best done by trying a variety of brands. Then, when you find one that pleases you, thoroughly acquaint yourself with its performance under different lighting conditions and with different types of subjects.
2. Use a good exposure meter. Keep in mind the subtle but important effects that even slight overexposure or underexposure can have on color–and select your exposure accordingly.
3. Use a filter when you need one. If you shoot in light that doesn't match your film, add a conversion filter. Also use a skylight or UV filter when the film manufacturer recommends it.
4. Bracket your exposure, if time permits. This gives you a choice and you can select the exposure that seems the most natural.
5. Try to get clean, neutral whites and natural-looking flesh tones. If these are off color, most viewers are quick to sense it. Avoid color reflections from nearby objects.
6. Where exact realism is your goal [in a color portrait, for example], avoid the yellowish light of early morning or late afternoon. Although good for effects, this light will make the colors in your picture look much warmer than normal, as we have demonstrated in the lesson.

Interpretive color

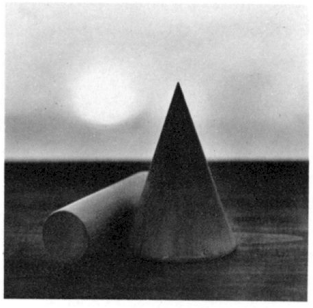
Exact realism may not always be your goal. Some of the pictures you take will be better if you deliberately change the colors to add emphasis or to express your reaction to the subject. For example, you may want to emphasize the blue-green sea in a seascape, or intensify the brilliant reds and yellows of autumn foliage. You have seen many fine examples of the interpretive use of color in these pages. Both for professional assignments and your personal picture-taking you'll find many opportunities to use color effectively in this way.

Here are some important things you can do to control color at the time you shoot the picture:

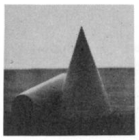
1. You can deliberately mismatch film and light. For example, to exaggerate the warm colors of electric lights after dark, shoot night scenes on daylight film.
2. You can select your lighting carefully. Outdoors, this means choosing appropriate weather conditions and a suitable time of day. Indoors, you can control the light source directly, even using colored "gels" in front of your lights for special effects.
3. By your choice of color filters you can make your picture warmer or cooler overall, or even give it a strong overall hue.
4. You can use deliberate overexposure to make your colors brighter and less saturated; you can use underexposure to make them darker and more saturated.

To use color creatively, you must be willing to experiment. Try more than one shot and more than one variation of an important subject. Use the various color controls we have demonstrated in this lesson and find out by practice how they can affect the colors you get. Record the data of exposure, film, lighting, and other factors when you take the picture and then compare the data with the result so you can achieve similar effects again, if you wish.

In color photography, as in black and white, there is no substitute for your first-hand experience. You learn photography only by taking pictures!



Technical notes on the photographs



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Bert Stern; Leica with a 50-mm *f*/2.8 lens; Anscochrome Daylight Type film; 1½ seconds at *f*/4; daylight.

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Arthur d'Arazien; 8x10 Deardorff with a 10-inch lens; Ektachrome Daylight Type film; open flash at *f*/22, plus a 2-second time exposure; mixed daylight, blue flashbulbs, and flash powder.

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Irving Penn; Rolleiflex with a 75-mm *f*/3.5 lens; Ektachrome Daylight Type film; bright sun exposure: 1/100 second at *f*/8; diffused daylight exposure: 1/15 second at *f*/8; daylight.

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Richard Beattie; 8x10 Deardorff with a 12-inch, soft-focus lens; Ektacolor film; 1/25 second at *f*/8; daylight.

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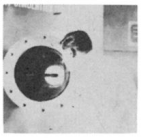

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Richard Avedon; 8x10 Deardorff with a 12-inch *f*/6.3 lens; Ektachrome Daylight Type film; exposure for electronic flash at *f*/16; electronic flash.

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Richard Avedon; 8x10 Deardorff with a 12-inch *f*/6.3 lens; Ektachrome Type B film; 1 second at *f*/11; studio lights.

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Famous Photographers Course
Famous Photographers School, Inc., Westport, Connecticut

Guiding Faculty
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Alfred Eisenstaedt
Harry Garfield
Philippe Halsman
Irving Penn
Bert Stern
Ezra Stoller

Lesson

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Outdoor lighting

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Working with outdoor light

The ultimate source of all energy on our planet—the sun—also is the creator of infinitely varied, beautiful, and evocative lighting effects for photography. The glare and dazzle of bright sunlight, the soft illumination of a rainy day, the dappled shade under trees, dawn, twilight, sunset, the patterns of light and shadow—these are only a few of the gifts of the sun to the photographer. Used with imagination and intelligence, the different varieties of outdoor light can help you immensely in achieving good pictures.

In this lesson, we'll show you how to use the sun to obtain almost limitless kinds of lighting effects, and how to control the illumination in your outdoor pictures to get the results you want. But before you can make sunlight work for you, you must understand certain basic facts about its nature and its ways.

The first thing to learn is how to *see* light. Unless we are trained to recognize the qualities of light, we usually aren't aware of them except in practical terms—for example, we recognize that it's bright enough to read by, or that it's getting dark, or that the sun is shining in our eyes. This, however, is too simple an approach for good photography. In the following pages you'll be shown how to look at light in a much more precise and sensitive way, so that you can judge its intensity, quality, and direction. We will demonstrate the different kinds of light and how to use them in your pictures.

How to control outdoor light

Obviously, you cannot make the sun stand still, turn it off and on, or change its position in the sky as if it were a giant studio floodlight. But you can exercise a greater degree of control over outdoor lighting than you may realize.

For example, by *changing your camera position* alone you can shoot with the sun behind you, or shining toward your camera, or with the light falling on the subject from the side. Sometimes you can achieve more effective lighting by *moving your subject*—from bright sun into the shade, for example, or the other way around. If you're photographing a person, just a slight change in the tilt or position of his head can make a big difference in the way highlights and shadows fall.

A third important control is *choosing the right time of day* for the picture. The direction of the light and the highlights and shadows it produces change constantly as the sun travels in its arc across the sky. Waiting until the light is best for your purpose provides a very useful, if indirect, control.

The direction and quality of light

In this lesson we demonstrate how to use four basic directions of light which are of great importance in outdoor photography—frontlighting, 45-degree sidelighting, 90-degree sidelighting, and backlighting. We show what each of these types of lighting can do for your subject in terms of modeling, emphasizing texture, creating light and shadow, and providing separation from the background.

As we have seen more than once, the high-contrast lighting of bright sunlight can be a problem in photography. The difference in brightness between highlights and dark shadows may be so great that your film's exposure latitude can't give adequate detail in both at the same time. Accordingly, we will show you some simple, practical methods for reducing contrast in outdoor photography. These methods include adding light to dark shadows with a white cardboard reflector or flashbulbs, and altering the relationship between exposure and development time.

As you gain experience you'll soon learn that some of your most pleasing pictures come, not when you're shooting in bright sunlight, but on hazy or overcast days, or in the shade. The soft, diffused light of these situations provides an even, gentle illumination that is excellent for many kinds of outdoor photography. You'll also find that some of the most interesting lighting—especially for color photography—occurs very early or very late in the day, enabling you to produce unusual pictures at these times.

Afterdark photography is another exciting facet of outdoor shooting. It calls for some special techniques to cope with the long time exposures generally needed. This type of photography is very much a matter of trial and error, even for professionals. But it does open up an entire new world to the photographer who is seeking fresh ways of seeing familiar subjects. We will cover the basic techniques which you can use for many of your night pictures, including a simple method for making more than one exposure on the same frame of film.

In developing your ability to use natural light you will find it a great help to study the work of experts. By looking closely at good pictures, you can learn much about the kind of light that prevailed when they were made and how the photographer put it to work for him. You should also make it a point to observe the light wherever you are, even when you're not taking pictures. Notice its direction, and watch how it affects different subjects. If the subjects change position, see how this changes the way the light strikes them.

Try also to estimate the degree of contrast that the lighting will produce in the picture. Remember that your film, whether color or black and white, is likely to record the contrast much more sharply than your eye sees it. Shadows will tend to look darker, with less detail in your pictures. You will soon become aware of this effect, and learn to correct for it, if you keep in mind how the scene looked when you photographed it and then examine your picture closely afterward.

Outdoor lighting is not something that is mastered quickly and easily. Learning to see light and use it creatively is one of the greatest challenges that any photographer faces in making pictures. Since natural light is so varied and changes so often, you may not always succeed in making it work for you in just the manner you wish. But your chances for using it well and creating effective, interesting pictures will be vastly increased if you have a sound knowledge of the techniques of outdoor photography—and lots of practice in applying them!

[*Facing page*] The sun itself is photography's most versatile source of light. As a creative photographer, you must be sensitive to the endless variety of lighting effects it produces. By a skillful use of these effects you can evoke mood, reveal form and texture, emphasize the subject, and strengthen composition in your pictures.

Learning to see light

Light is essential in taking a picture–any place and any time–yet an inexperienced photographer may give it only superficial attention. So far as he is concerned, there is either enough light to take his picture or there isn't. Actually, however, light is extremely variable, and you should become keenly sensitive to its variations. As a creative photographer, you must learn to *see*, *evaluate*, and *control* light in terms of how it will affect the mood and meaning of your pictures.

A good way to begin to see light critically is to go outside on a bright, sunny day and look around you. Study the sunlight and what it does to things. Where the sun shines on the surface of an object you will see planes or areas of light. Some spots receive greater illumination than the rest, and here you will notice brilliant highlights if the surface is reflective. Where part of an object is blocked off from the sun's rays you will see planes of shadow, some darker, some lighter, for the shadows, too, receive different amounts of light. Depending on the way light and shadow fall on an object and model its contours, they can reveal its form and texture with great clarity or make it appear so inconspicuous that you may hardly notice it.

The position of the sun in relation to your subject determines the *direction* of the light–where the light and shadow areas will be. Since the sun is always changing its position and photographic subjects come in an endless variety of shapes, sizes, and arrangements, it's impossible to give exact rules for how light and shadow will fall in every shooting situation. It will be up to you to evaluate the lighting each time you take a picture. However, there are certain basic positions of the sun that have important effects in photography, and we are going to familiarize you with them in this lesson.

To judge how daylight will affect your picture, you must be aware of the light's *quality* as well as its direction. Whenever the sun shines brightly in a clear sky, its rays tend to be concentrated. Shadows usually are dark, with distinct, sharp edges, and highlight areas are very bright. This creates high contrast. Because the highlights and shadows stand out so clearly–as, for example, in the photograph of the children on the facing page–it is relatively easy to tell the direction from which the light is coming. [In photographic language, we say the lighting is highly *directional.*]

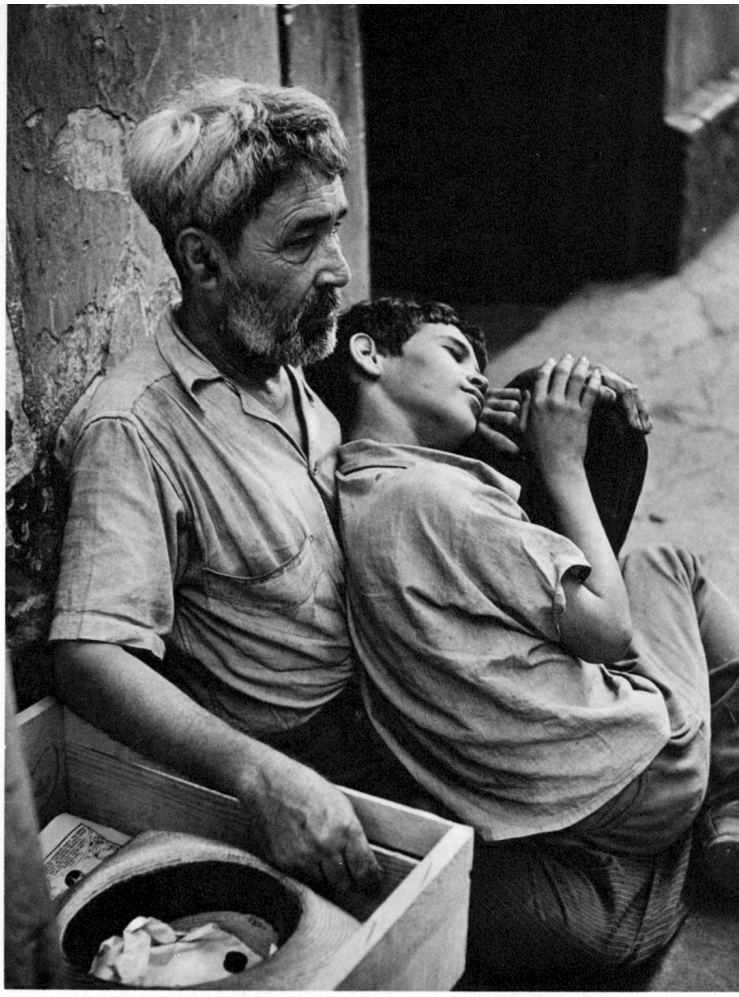
At other times daylight may be more diffused–for example, on a bright hazy day when the sun is partially veiled, or on a heavily overcast day, or in the shade. Under these conditions the rays of light are more scattered and shadows are less distinct. [In extremely diffused light, shadows may not be noticeable at all.] The more diffused the light is, the lower the contrast will be–the highlight and shadow areas will be closer together in value. We say this kind of lighting is *soft.* Forms usually will seem flatter and less well defined, and it may be difficult or even impossible to determine the direction of the light accurately.

So far we have mentioned two characteristics of light–quality and direction. There is still another one, *intensity.* As we pointed out in our discussion of light and color in the preceding lesson, intensity is the *brightness* of the illumination–it is what your exposure meter measures. Don't confuse intensity with quality. Although bright, intense light is often harsh and contrasty, this isn't always so. It can be quite lacking in contrast at the beach on a hazy day, for instance. Nor is weak light necessarily soft and diffused. Consider the last rays of the setting sun, or moonlight; the light is weak, but casts sharp, well-defined shadows.

As a guide to judging the quality and direction of light, the shadows can be especially helpful. Look at them carefully–in subjects you are photographing or in pictures made by other photographers. Ask yourself: Are these shadows dark and clear cut or soft, with blurred edges? In what direction do they fall? Becoming aware of such details is a major part of training yourself to really see light as a photographer.

The glare and dazzle of a bright sunny day was chosen by Ezra Stoller to emphasize the glass-and-metal construction of this giant building. Notice that, at the far end of the building, he caught a reflection of the sun, making it a center of interest, and that he used the clean, sharp pattern of light and shadow on the bars of the window in the foreground to create a geometric frame through which we view the building. Again, to determine the position of the sun, look closely at the shadows cast by this highly directional light.

In this photograph Alfred Eisenstaedt has evoked the nostalgic mood of an autumn afternoon in a small town largely by the direction and quality of the light he selected. The late sun is low and in back of the scene; it throws slanting, concentrated light toward the camera. By taking advantage of the dark, distinct shadows of the children and the leafy trees, Eisenstaedt was able to give interest to the large area of pavement, which under different lighting conditions might well have been dull and uninteresting. He has also made good compositional use of the shadows on the pavement–they lead the eye into the picture and tie the foreground, middle ground, and background together. Notice, too, how the touches of brilliant highlight on the children's hair attract attention to them. Even though the sun is hidden, you can easily determine its position by *the way the shadows fall.* They are like arrows pointing toward the light source. [Courtesy *Life* magazine, ©Time, Inc.]



Diffused light has a different kind of beauty, and creates a different mood than does high-contrast light, as shown in this sensitive photograph of a Puerto Rican father and child by Philippe Halsman. The picture was taken on an overcast day. The light is fairly directional–we can see that it falls from the right and high overhead. However, notice that the shadows are soft, with indistinct edges. We see silvery grays and delicate gradations of middle tones, but no strong contrast of extreme white and black. The lighting enhances the gentle, sympathetic mood of the picture.

The four basic directions of light

In the following pages we take a close look at the four basic directions of outdoor light–*frontlighting*, *45-degree sidelighting*, *90-degree sidelighting*, and *backlighting*. Each kind of lighting, we shall see, creates different effects and has certain advantages.

In our demonstrations, we show how these four basic directions of light affect a very simple form, an egg, as well as a more complex one, a human face. We also show how members of your Faculty have used each type of lighting to solve a particular problem or achieve a certain effect. Pay particular attention to the diagrams–they indicate the relative position of the camera, the subject, and the sun.

As we've pointed out, the directional effect of light is most evident on a clear day when the sun's rays are highly concentrated. When shadows are softer and highlights less intense–as on a cloudy day or in the shade–the directional quality of light is less emphatic.

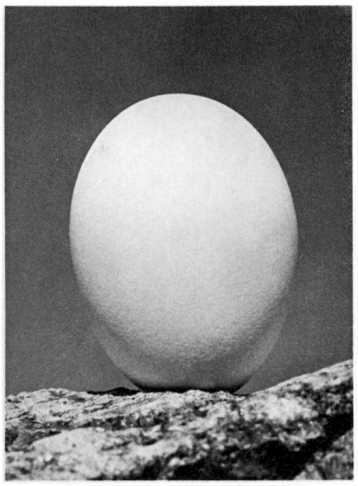
Frontlighting

Frontlighting is the kind of lighting you get on your subject when you follow the common advice given to beginning snapshooters: "Shoot with the sun in back of you." [See the diagram.] If the sun is fairly low in the sky, as it is early in the morning or late in the afternoon, the light falls on the subject practically "head on," and there are almost no shadows visible to the camera. This lighting is very "flat"–it does not emphasize the solid, three-dimensional form of your subject.

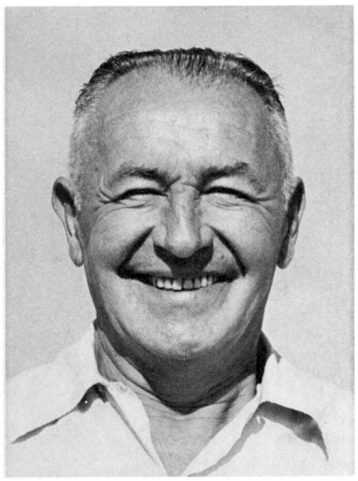
If the sun behind you is fairly high in the sky, the result is high frontlighting. This casts some small shadows, which are visible to the camera and bring out the solid form and contour of the subject more distinctly. High frontlighting gives a greater feeling of depth and form than low frontlighting, and is often a better choice for shooting outdoor portraits. However, even high frontlighting is relatively flat in comparison with other directions of lighting we will demonstrate. Also, any frontlighting may shine into a person's eyes and cause him to squint. For these reasons, many photographers avoid frontlighting if they have a choice in the matter.

There are occasions, of course, when a flat light may give you the very effect you want. For example, flat frontlighting may be useful to emphasize the values in the subject itself, without obscuring or complicating them with highlights and shadows. It's a logical choice for some kinds of color photography where you don't want large areas of dark shadow in the picture.

One final caution regarding frontlighting: If possible, avoid shooting at midday with a bright sun very high in the sky. At this time the lighting–called *toplighting*–falls from directly overhead. Toplighting can create harsh, unpleasant black shadows in the sockets of the eyes and under the nose, and therefore generally should not be used for outdoor portraits. Naturally, the shadows produced by toplighting are less important and not so objectionable when you are shooting architectural subjects or landscapes.

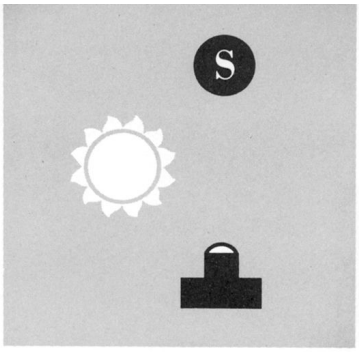


High frontlight on an egg produces a minimum amount of modeling. The only shadows are found toward the bottom. While this relatively flat lighting brings out the whiteness of the egg, it does not help to create a strong feeling of solid form.



High frontlight on a face characteristically produces a small butterfly-shaped shadow under the nose and a larger shadow under the chin. Because the light is shining almost directly into the man's face, it causes him to squint uncomfortably.

Richard Avedon used high frontlight with interesting results in this beach fashion picture. He avoided an overly flat effect by choosing a low camera angle which helped him emphasize the large shadow cast by the model's broad-brimmed hat, the shadow on her right leg, and on the chair. Notice how the light was caught, bright and sparkling, on the splashes of water, adding a feeling of spontaneity and motion. [Courtesy *Harper's Bazaar*]

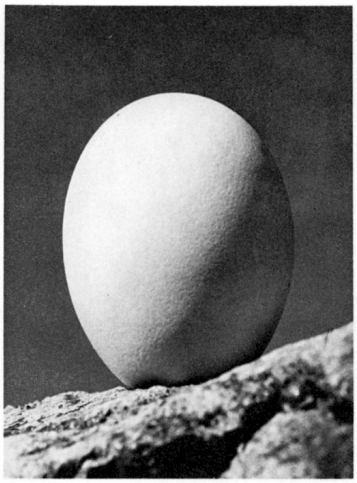


45-degree sidelighting

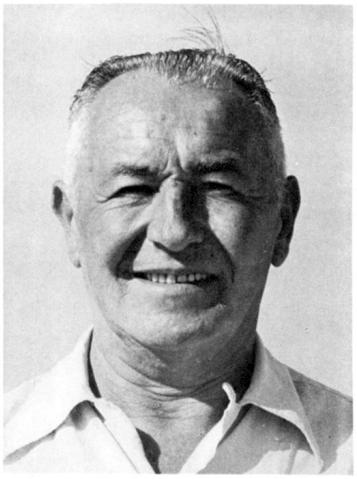
You get this type of lighting when the sun is about 45 degrees to one side of your camera and about midway between the horizon and its zenith or highest point.

Many photographers consider this a more interesting light for most subjects than frontlighting because it produces a wider range of values. The stronger highlights and shadows caused by 45-degree sidelighting create a more convincing feeling of three-dimensional objects existing in depth. This lighting also tends to reveal the texture of surfaces more markedly than frontlighting.

Of course, 45-degree lighting also may increase the contrast in a picture. This can pose a problem if the difference in brightness between the shadows and highlights is too great, because you may not be able to use a compromise exposure [explained in the lesson on black-and-white photography] that will give good detail in important dark and light areas. With color film in particular, which does not have the exposure latitude of most black-and-white films, too much contrast may give you trouble. We'll explain various methods of solving the problem of lighting contrast later in this lesson.

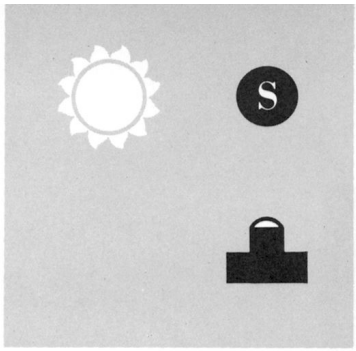


The 45-degree sidelighting creates a marked shadow on the egg, bringing out its form and giving it a feeling of three-dimensional roundness. Illumination that produces highlights and shadows is often more interesting than flat, shadowless lighting.



A 45-degree sidelight creates shadows that model the head—that is, show up its solid structure and the shape of the features. On the left cheek is a triangular highlight surrounded by shadow, which is one of the characteristic effects of 45-degree lighting on the face.

Ezra Stoller frequently chooses 45-degree sidelighting for his architectural photographs because it effectively reveals the form and texture of buildings. In this straightforward "portrait" of a modest frame house, see how the cast shadows emphasize the overhang of the roof, the recessed plane of the door, and the outthrust form of the bay window so that the building really seems to exist in depth. The shadow pattern of leaves adds interest to the right-hand portion of the house.

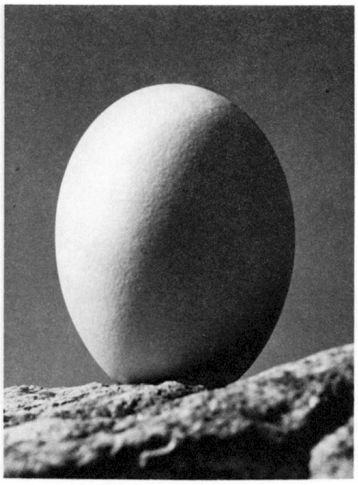


90-degree sidelighting

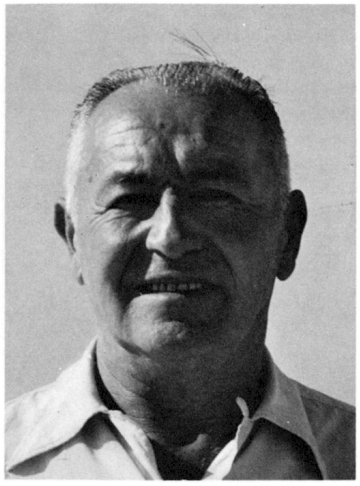
The most extreme and dramatic form of sidelighting occurs when the sun is at a 90-degree angle to your subject–that is, fully to the side of it, as shown in the diagram above. [The lower the sun is, the more marked the effect of sidelighting will be.] At this angle the light often creates strong contrast between light and dark. For example, notice in the portrait that half or more of the man's face is in deep shadow, while the rest is in bright light.

Ninety-degree sidelighting skims the surface of your subject; it produces highlights and shadows wherever there is even a slight irregularity. This makes a very effective light for emphasizing texture. In fact, extreme sidelighting sometimes is called "texture lighting." In a portrait, skin texture may show up very strongly with 90-degree sidelighting. This might be exactly what you want when photographing a rugged-looking man, but not be desirable when your subject is a woman.

You often can make striking pictures with lighting at this angle because it gives you lights and darks in a bold, well-defined pattern. In taking a picture by sidelighting, remember to consider the arrangement of the shadows; they are an important part of the composition, and can help–or hinder–the effect you want.

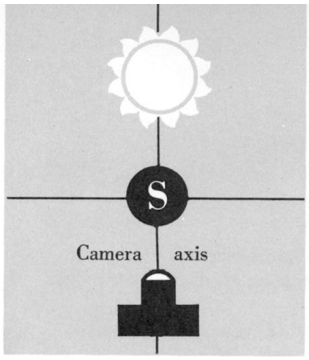


Ninety-degree sidelighting divides the egg into strongly contrasting areas of light and shadow. The "dividing line" slants slightly because the sun was a little above the horizon. This illumination creates a form-revealing shadow and brings out the texture of the egg.



In this portrait, one side of the man's face is covered with deep shadow, while the other side is struck by the sun, making the skin texture show up clearly. The extent to which sidelighting illuminates the top of the head depends on how high the sun is.

A drum major of the University of Michigan Marching Band takes a high step–and his youthful followers try to emulate him–in this spirited picture, made by Alfred Eisenstaedt with 90-degree sidelighting. The figures are marching almost directly into the light of the late afternoon sun, and the long shadows they cast tie them together and emphasize their line of march. The shadow of the leaves in the foreground adds a varied pattern to the large expanse of grass.
[Courtesy *Life* magazine, ©Time, Inc.]



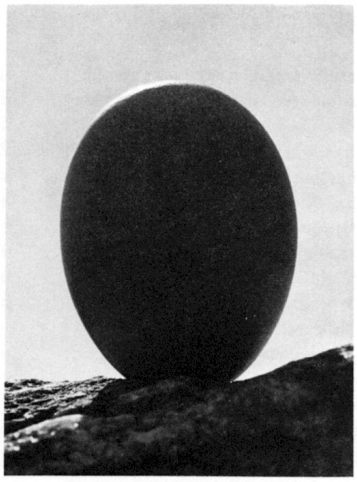
Backlighting

When the sun is behind your subject you have backlighting. In its most extreme form—when the sun is low in the sky and directly behind the subject—you have to shoot straight into the light. Backlighting is less extreme when the sun is higher in the sky and slightly to one side of the subject. However, to be considered backlighting, the sun must be behind an imaginary line drawn through your subject at right angles to your camera axis as shown in the diagram above.

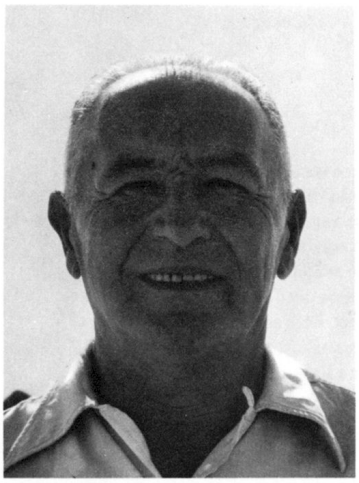
Backlighting produces bright sparkling highlights and large, simple areas of deep shadow. These shadows thrust themselves toward the camera, giving a heightened impression of depth. [As with sidelighting, certain angles of backlighting also emphasize texture.] Often backlighting will make a silhouetted subject stand out strongly against a bright background. The sharp contrast between the glittering highlights and black shadows can produce a dramatic, almost theatrical effect. By experience, we tend to associate backlighting with sunrise or sunset, with the late sun of midwinter, with firelight—nostalgic, romantic, evocative associations that you can put to good use in your pictures. All of this makes backlighting a favorite with many photographers.

Exposure, of course, is of great importance in backlighted situations. Depending on the effect you want, you might expose for the shadows or the highlights, or use a compromise exposure. Review the demonstration, "Exposure Control in Contrasty Light," in the lesson on black-and-white photography.

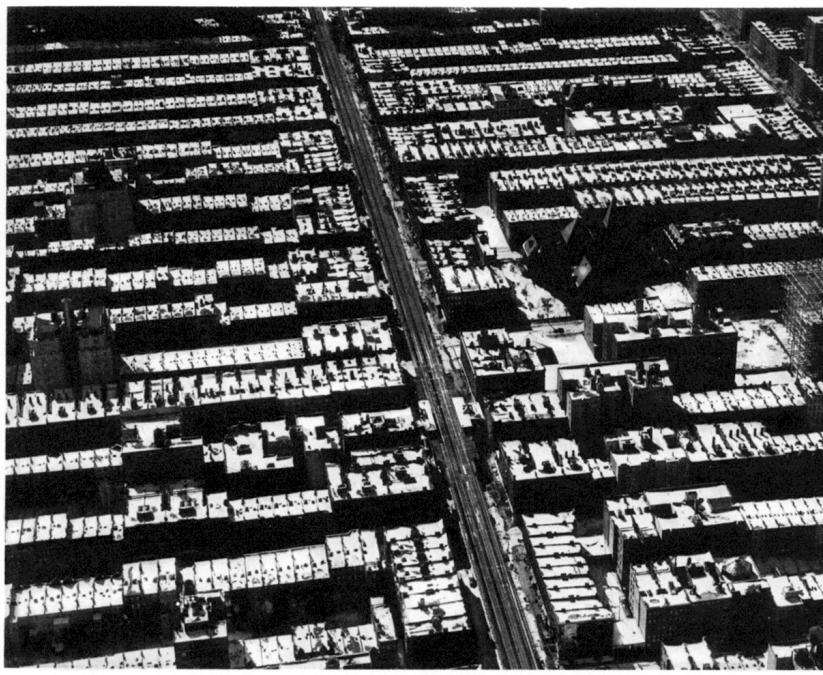
When you use backlighting, be sure to put a *lens shade* on your camera to protect the lens from direct rays of light. These rays can cause "flare"—bright patches in the picture, produced by light reflections inside the lens. The lens shade [also sometimes called a lens hood or sunshade] is a round or square hood which you attach to your lens mount. Lens shades are available in various designs to fit most cameras. Some screw on, some snap on, and some are locked in position with a bayonet-type mount. A lens shade is particularly necessary when taking pictures early in the morning or late in the afternoon, since you need to shoot almost directly into the sun.



Backlighting leaves the front of the egg almost completely in shadow except for a thin rim of light at the top. This simple, familiar object loses its characteristic light color and takes on a dramatic quality as it stands silhouetted against the brilliantly lighted background.



In portraits, backlighting throws the face into shadow. Here the exposure was chosen to obtain a dark semisilhouette effect, with just a rim of light on the head for contrast. However, you can expose for maximum detail in the shadows or use a compromise exposure. With either of these you can obtain soft, even illumination which is quite flattering to the subject because it subdues wrinkles and skin texture.



Joseph Costa has used strong backlighting to create pattern and texture in this aerial photograph. The high contrast between the snow-covered rooftops and the black, shadowed sides of the buildings turns city blocks into a bold, almost abstract design of light and dark bands. Here, the backlighting, with its strong highlights and shadows, brings out all the jagged surface irregularities—the chimneys, ventilators, water tanks, and upthrust masses of the taller buildings. Use it in your own photographs when you want to emphasize the overall texture in a scene. [Courtesy New York *Daily News*]

How to control lighting contrast

When you are shooting portraits in bright sunlight, extreme contrast between important highlight and shadow areas in the face can be harsh and unpleasant, creating an unflattering likeness of the subject. Even in photographs of landscapes or buildings, where strong contrast is not likely to be so noticeable or disturbing, there may be times when you will want to lower this contrast to get a softer effect.

As we've pointed out before, a compromise exposure is often a good solution to the problem of high-contrast lighting. Sometimes, however, the range of brightness between highlight and shadow may be too great to allow effective use of a compromise reading. Fortunately, there are several things that you can do to reduce excessive contrast. Here we show you four of them. Choose the one which is most practical for your subject and lighting conditions.

1 Use flat frontlighting. If you have a choice of camera position, or can pose your subject, or can wait until the sun is in the right place, this method may be a good one for you. As we have demonstrated, frontlighting produces few shadows and gives generally even illumination. For some subjects this may be an excellent way to reduce lighting contrast.

2 With portraits, use a reflector or flash to direct more light into the shadow areas and soften them.

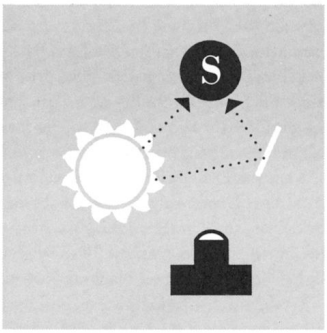
3 Backlighting is another solution with portraits. Simply turn the subject so the sun is behind him and his entire face is in shadow.

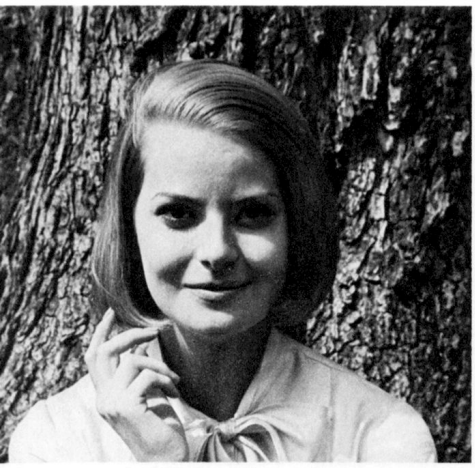
4 When it's impossible to subdue contrast in the ways already mentioned, you can achieve some control by varying the relationship of exposure to development.

Next we'll demonstrate in detail how to apply all of these methods except the first, which was shown earlier. Of course, there is still another method—in printing, your choice of contrast grade of paper [or contrast filter] also affords you a chance to control the amount of contrast in the picture. But generally you'll achieve better results, with less difficulty, if you control contrast at the time you take the picture.

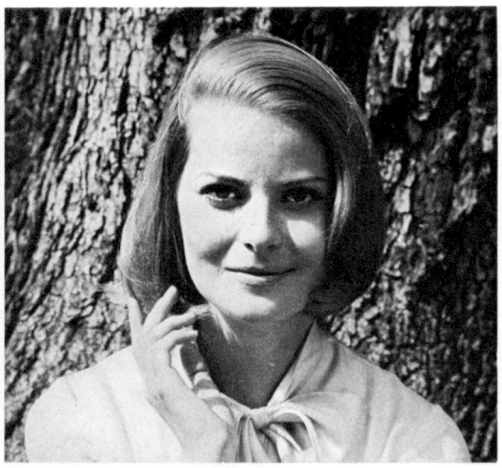
Using a reflector

You can make a simple reflector from a large sheet of white cardboard. Hold it or prop it up to reflect light into the shadows and reduce contrast. Some photographers fasten a sheet of aluminum foil, which has first been crumpled and then flattened out, to the back of their cardboard reflector so they also have available another surface which will reflect more intense light. When you need a reflector but don't have one with you, a white towel, a bedsheet, or even an opened-out piece of newspaper will do. Or perhaps you can take advantage of a natural reflector such as sand at the beach or a light-colored wall by posing your subject close to it.





Too contrasty: Here is a typical outdoor portrait made in the bright sun with 45-degree sidelighting. It has fairly high contrast, which gives the girl an almost haggard look. The photographer decided he would like to reduce the contrast by lightening the deep shadows on her face.



Lower contrast: To achieve this softer, more pleasing effect, the photographer directed some light into the shadows on the girl's face with a white cardboard reflector.

The setup: The photographer is holding the reflector, a sheet of stiff white cardboard, so that the sunlight strikes it and is reflected [*see diagram above photo*] into the shadow areas on the model's face. A lightweight reflector like this is easy to move around for just the right visual effect. If you wish, you can put a simple "prop stick," similar to the kind used on standup picture frames, on the back of the reflector so you don't have to hold it.

Using fill-in flash

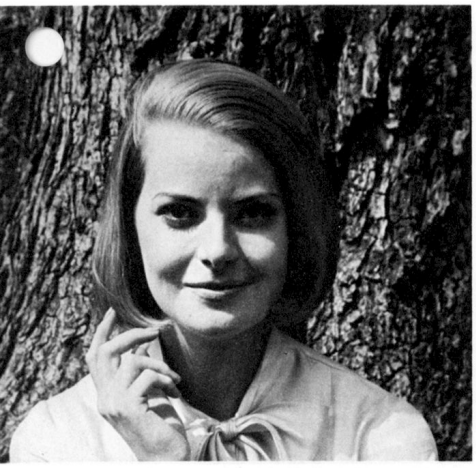
Another way to reduce contrast in pictures of people made in bright sunlight is to "fill in" the deep shadows with light from a flashbulb or an electronic flash. This method is known as "fill-in flash."

With this procedure your goal is to add enough light to the shadows to soften them, but not so much that you lose them completely. If the bulb is too strong or too close to the subject, you will get too much fill light. The daylight will be overpowered and the subject will look washed out and unnatural. If the bulb is too weak or too far away, not enough light will reach the shadow areas and the contrast between highlights and shadows will remain too great.

When you use fill-in flash, it's important not to overpower the sunlight falling upon the rest of the subject. The flash is meant to lighten the shadow areas–*not* create highlights. Take an exposure-meter reading of the highlights on the person's face and expose for these areas. The basic exposure of the picture is determined by the *sun, not the flash.*

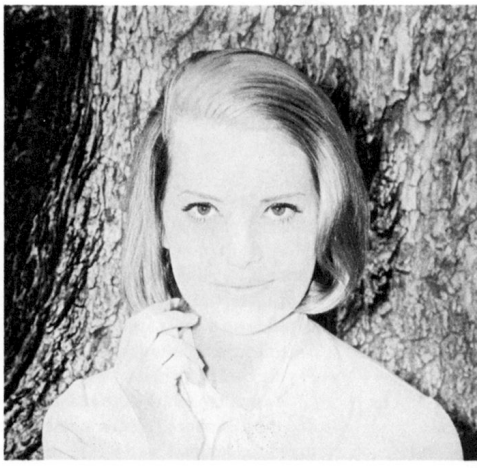
For the flash to be weak enough to fill in the shadows without introducing new highlights–while you stand close enough to the subject to get the picture you want–you may have to reduce the amount of light that reaches the subject. You can do this by covering the flashgun reflector and bulb with a white handkerchief, sometimes doubling it to reduce the light still more.

Proper exposure is a very simple matter once you know the basics of flash photography. These are given in the next lesson. We suggest you first learn the purpose of fill-in flash and how to use it to reduce contrast. Then turn to the Technical Manual, where more details are given on properly balancing it with daylight.

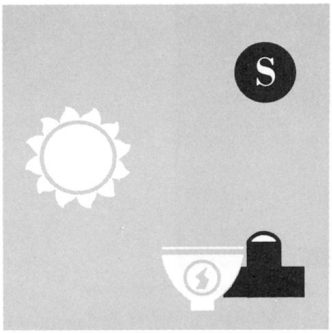


Too contrasty: This outdoor portrait with 45-degree sidelighting has too much contrast between the highlights and dark shadows.

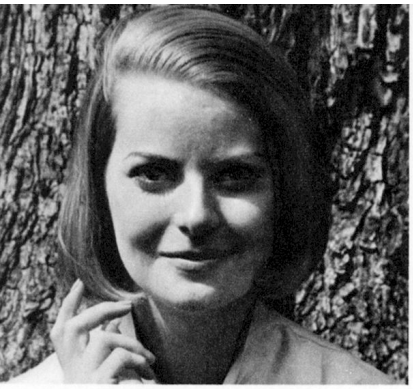
Lower contrast: By using fill-in flash, the photographer made the shadows less intense and thus reduced contrast. Note that the additional light from the flash has not completely overpowered the shadows; the sun still supplied the highlights in the portrait.

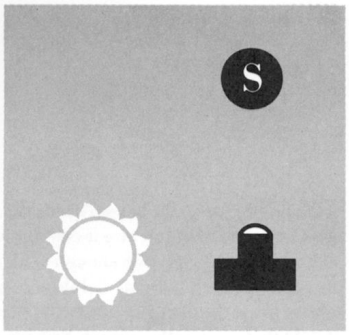


Too flat: The lighting is flat and unnatural here because the photographer used too much flash fill. The shadows have been washed out completely, and the sunlight has been supplanted by the flash.

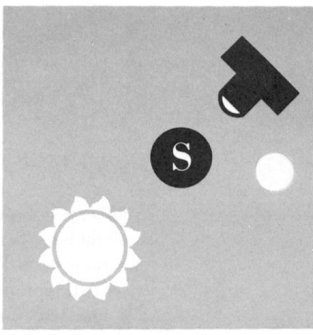


The setup: This is the setup used in making the correct [second] portrait above. Since the photographer wanted to shoot the picture fairly close to the subject, he reduced the strength of his flash by covering the front of it with a white handkerchief. [At this distance the uncovered flash would have filled in the shadows too much, as in the portrait at right.] Of course the flashgun should be attached to the camera or held close to it, as here, to provide even frontlighting.





Too contrasty: Shooting with 45-degree sidelighting on a sunny day produced these unpleasantly deep shadows on the girl's face. To avoid excessive contrast–without using a reflector or fill-in flash–the photographer decided to try backlighting his subject.



Lower contrast: By moving the girl so the sun is behind her, and bringing the camera around in front of her [*see diagram*], the photographer reduced the contrast in the face–it's now entirely in soft, even shadow. There is still some contrast in the picture as a whole–between the face and the highlight on top of the girl's head, for example. But we are more concerned here with the face itself, which now is gently and pleasingly illuminated. Usually, with backlighting, you should expose for the shadowed face and let the background go overexposed. However, if you wish to retain some detail in the background, you may be able to use a compromise exposure.

Backlighting portraits

Backlighting is one of the easiest ways to handle the contrast problem when you're shooting portraits outdoors. Simply position the subject so the sun is in back of him and his face is in shadow. Compare the two photographs above for a typical example of how backlighting can improve a portrait.

Reducing contrast by overexposure and underdevelopment

As you may remember from our lesson on black-and-white photography, the relationship of exposure to development can influence the contrast in a negative. Overexposure tends to lower contrast because it builds up density faster in the shadows than in the highlights, while extra development tends to increase contrast because it builds up density faster in the highlights than in the shadows. You can use this principle as a means for reducing the contrast when you shoot in very contrasty light.

Most of the pictures you take probably will require normal exposure and the film should receive normal development. However, if you wish to reduce contrast, and it is impractical to do so by any of the methods we've discussed so far, you can give *more-than-normal* exposure and then *reduce* developing time. How much you do of each is, to some extent, a matter of personal taste; it also depends on the particular combination of film and developer you are using. However, try this as a starting point:

Overexpose by one full stop.
Reduce developing time by 25 percent.

This method of contrast control is especially convenient if you are using single sheets of film, which can be processed individually. With roll or 35-mm films you'll need to give the entire roll additional exposure and decreased development–unless you're prepared to cut the undeveloped film into sections so that you can give all the overexposed frames underdevelopment and any normally exposed frames normal development. Obviously, this can be an inconvenient procedure; it's usually best to reserve the exposure-development control of contrast for situations where the entire roll is to be used on the same subject.

Too contrasty: This photograph, normally exposed and normally developed, has high contrast because it was shot in bright sunlight. Some of the shadows are so black that hardly any detail can be seen in them.

Lower contrast: Increasing exposure by one full stop and decreasing development time by 25 percent has made the photo lighter overall and somewhat less contrasty. Both pictures were taken under the same lighting conditions and printed "straight."

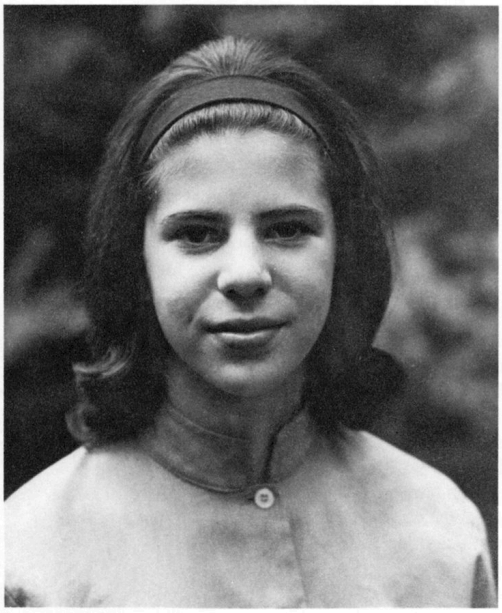
Getting out of the bright sun

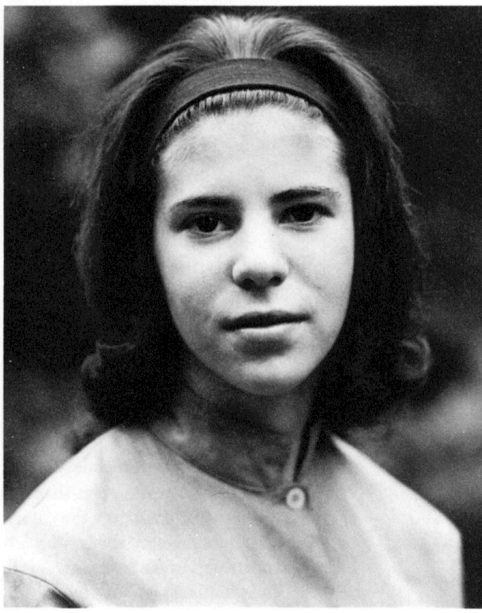
Up to this point we've been considering how to take pictures in bright sunlight. You've seen some of the effects that this generally strong and concentrated type of illumination can give—how it sometimes causes excess contrast—and how you can solve this problem. However, all your outdoor pictures need not be made in bright sunlight. In fact, many professionals, including members of your Guiding Faculty, often prefer to get out of the bright sun for their photographs. There are very good reasons for this choice.

On days which are dull and overcast—or even when there is a slight haze over the bright sun—the light is naturally much less harsh than it is on a sunny day. On bright days you can also get a soft, pleasant light that's ideal for many photographs—especially portraits—by shooting in the shade of a wall or building or in the diffused daylight under a tree. You can even shoot before the sun rises or after it has set. Knowing how to use and control the less intense light available in these situations is an important part of the technique of taking good photographs outdoors.

Shooting on different kinds of days

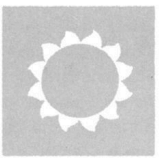
These three photographs by Harry Garfield illustrate the quality of illumination you get on three different types of days and how it affects the appearance of a portrait subject. These examples show that the diffused light of a hazy or cloudy day often is more attractive than bright sunlight for portraits, as it is for many other subjects.





Bright sunny day: Here is the type of light we have dealt with so far in this lesson. It is high in contrast—the shadows tend to be deep and without much detail, while the highlights are extremely bright. This harsh light often is not flattering for portraits, either in color or in black and white, unless fill-in lighting—or some other method of reducing contrast—is used.

Bright hazy day: In this portrait, contrast is much softer because the sun was shining weakly through a thin layer of clouds when the picture was taken. There is still quite a difference between the highlights and shadows—enough to give a feeling of considerable roundness and solid form to the subject—but the shadows are lighter than they are in the picture taken in the bright sun and they contain more detail. Many photographers prefer the illumination of a hazy day for portraiture in general. They find it particularly good for pictures of women and older people because the softer light does not emphasize the skin texture.



Dull overcast day: The lighting on a dull overcast day is even more diffused and lower in contrast than on a hazy bright day. The shadows are extremely soft—sometimes barely discernible—so that contours are only slightly modeled and the subject appears somewhat flat.

Open shade

In photography, any shade caused by a building, wall, or other object which blocks off the sunlight but leaves blue sky overhead is called *open shade*. The light in open shade is soft and relatively directionless, and causes no *pronounced* shadows. This makes it particularly flattering for pictures of people.

The low-contrast lighting usually found in open shade fits well within the exposure latitude of color film and is excellent for color portraiture. However, open-shade light is generally bluish. To keep this excess blue from affecting the colors in your pictures, it's often a good idea to shoot through a warming filter, such as the skylight filter we demonstrated in the lesson on color photography.

The photograph above by Alfred Eisenstaedt, showing a family of South American Indians, was taken in the open shade of a building. [By contrast, the street beyond the building is in bright sunlight.] Notice that it is not completely "flat"–the shadows are distinct enough to indicate depth and form, as, for example, in the folds of the clothing, the hats, and the basket. Since the lighting does not create strong values of highlight or shadow, the values in the subject itself are emphasized.

Diffused daylight is also found in deeper shade, such as under an overhanging roof or on a porch. In the diffused light of very deep shade, the contrast often will be lower, and the lighting even less directional, than in an open-shade situation such as this one.
[Courtesy *Life* magazine, ©Time, Inc.]

Broken daylight

This type of light is found where bright sunlight is broken up by, or filtered through, leaves, vines, bushes, or other foliage. For soft, low-contrast lighting on a sunny day, pose your subject in the partial shade cast by such foliage, as Philippe Halsman did in this portrait of Audrey Hepburn. Strong sunlight is falling on the scene as a whole, but the girl is softly and evenly illuminated, except where direct sunlight breaks through to touch her left forearm and right shoulder. Halsman exposed for the less intense light on her face, letting the brightly illuminated background go very light.

Ezra Stoller chose twilight to make this photograph of the Carlton Hotel in Bermuda. Note the contrast between the soft, dying light of sunset in the sky and the dark trees in the foreground. The street lights up front and the lights in the hotel rooms add touches of brightness to the scene. [Courtesy Hotel Corporation of America]

Twilight and predawn

Twilight and before dawn offer you a good opportunity to make unusual pictures. At both of these times, the light gives bluish tones to the landscape and sky. You will frequently notice that the sky is relatively bright compared to foreground objects, which loom dark and may appear as silhouettes. The contrast in other areas generally is very low.

You can obtain a variety of interesting effects when you take pictures in this kind of illumination. Shooting at twilight, for example, you may be able to include lights in buildings, car lights, or street lights—small bright highlights that will enliven the scene. Predawn illumination often has a unique, misty quality that you can capture in your photographs at no other time.

For the most part you'll find it wise, when shooting at twilight or before dawn, to make several different exposures of the same scene. An overall meter reading may be strongly influenced by the lighter sky—with the result that you may record foreground objects as partial or full silhouettes. This often can be effective, but if you want a clearer picture of the detail in the dark foreground areas, open up one stop at a time for an additional two or three shots. When you view your results, you can select the shot you feel is best.

Increasing contrast by underexposure and overdevelopment

Although the most common problem in shooting outdoors is excessive contrast, occasionally you will encounter the opposite problem: lighting that is *too* flat and low in contrast. This is most likely to happen in some of the situations we've been discussing—in very deep shade, for example, on an overcast day, or in twilight and predawn illumination. If you need to increase contrast, you can do this by *underexposing* a specific amount and later giving a *longer-than-normal* development time.

If you're working with flat lighting or with a very low-contrast subject, try this combination as a starting point:

Underexpose by one stop.
Give 50 percent more developing time than you normally would.

Vary either factor somewhat to get exactly the results you want. You can apply this technique with the film you normally use for outdoor work, or with one of the slower, fine-grain emulsions, which give somewhat more contrast than faster, grainier film. The two photographs at the right demonstrate how this procedure helps to compensate for a flat, low-contrast lighting situation.

Too flat: This picture was taken on a dull overcast day. The light was soft and the overall scene quite low in contrast. Normal exposure and development were used. The result is a rather flat picture that is relatively monotonous in tone.

Increased contrast: The scene was shot again under exactly the same lighting conditions—but exposure was decreased by one full stop and development time lengthened 50 percent. The result is an overall increase in contrast, with more distinct differences between the light and dark areas and a greater feeling of depth.

Outdoor photography after dark

You don't have to stop taking pictures just because it's night. There are rich possibilities for imaginative outdoor photography after the sun has set, and photographers should know how to take advantage of them.

Several sources of light are available to you after sunset. First, there's the fading light in the sky, directly after the sun goes down, and later there is moonlight. Finally, you can use the artificial light at the scene, such as street lamps, building lights, neon signs, and theater marquees. Whatever the source of light, night pictures often require relatively long exposures—running to seconds, minutes, or even hours.

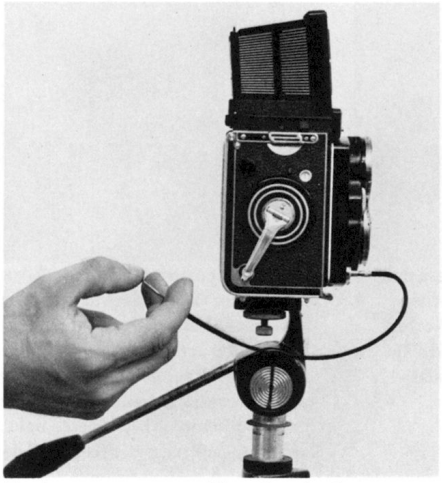
Sometimes the slowest shutter speed marked on your camera will be too fast for making pictures at night. This means that you must make a time exposure. To permit longer exposures, most cameras have a time [T] or bulb [B] setting. Some cameras have both these settings and some only one.

When you use the time setting, you press the shutter release to open the shutter, and it stays open until you press the release again.

The bulb setting, however, operates somewhat differently. The shutter opens when you press the shutter release, but it stays open only as long as you keep the release pressed down.

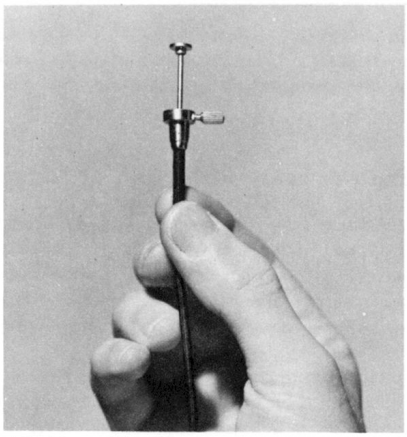
Naturally, you can't hold the camera in your hand during these longer exposures without getting a blurred image. You need a *tripod* or some other sturdy support for the camera to hold it steady. Another must is a *cable release*—an accessory consisting of a flexible cable with a wire running through it. You attach one end of the cable to the shutter release; the other end is equipped with a plunger which permits you to trip the shutter without actually touching the camera. With the cable release, you won't jar the camera during exposure. If you use the bulb setting, we recommend a *locking cable release*, which enables you to keep the cable-release plunger down during the exposure without having to hold it.

How long should night exposures be? This depends, of course, upon the amount of illumination, the film used, and the effects you want to obtain. Start with the exposure times suggested in the Technical Manual, and bracket your exposures—that is, take two extra shots, one slightly underexposed and the other slightly overexposed, compared to your basic exposure. Bracketing by full stops is advisable with black and white; by half-stops with color. After sufficient experience, you may be able to choose your afterdark exposures with some accuracy. However, the bracketing technique is used by many professional photographers for afterdark shooting.



For long exposures, you'll need a tripod or other support to hold the camera steady. A cable release is also a help; you press the plunger to trip the shutter.

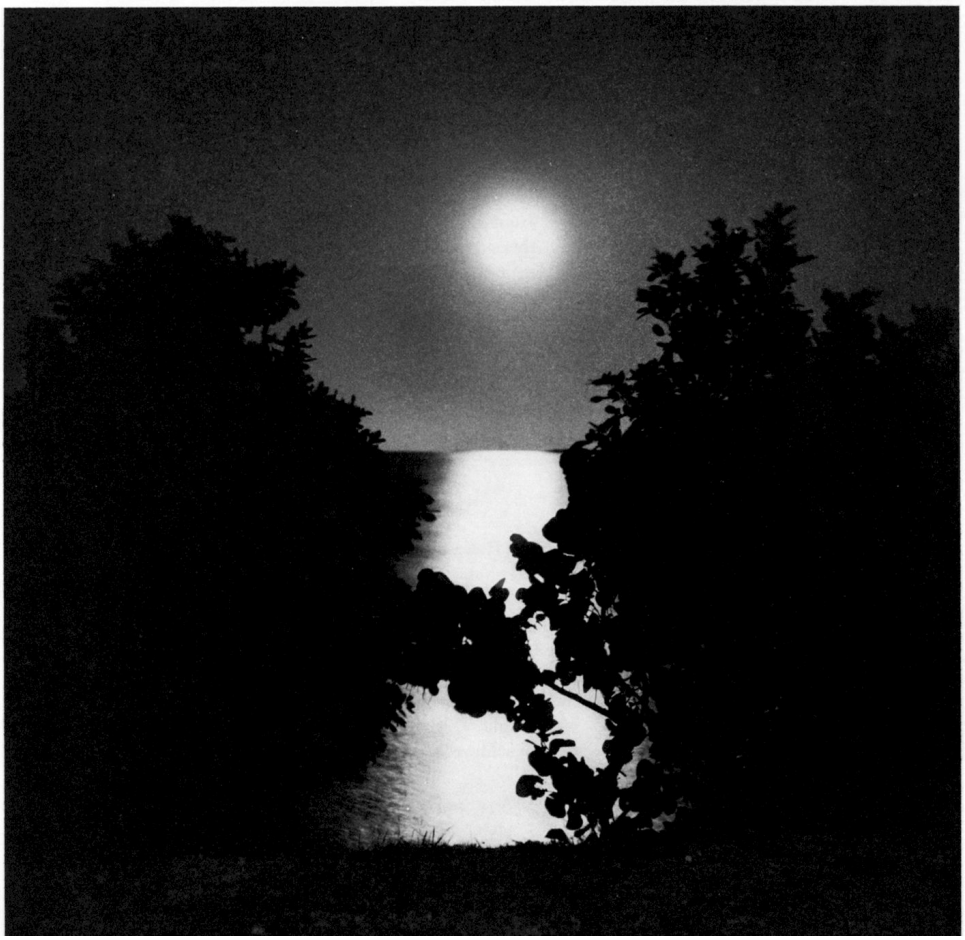
If you are caught without a tripod, you can use a substitute—a car fender, hydrant, rock, or any other support of the right height will do. Tilt the camera to whatever angle you need and prop it up with a matchbook, a small stone [shown here], or some object that can act as a wedge.



A locking cable release is a great convenience if you use the bulb setting with longer exposures. You don't have to hold the cable-release plunger down to keep the shutter open—you tighten a small setscrew, which holds the plunger down. To end the exposure you loosen the setscrew.

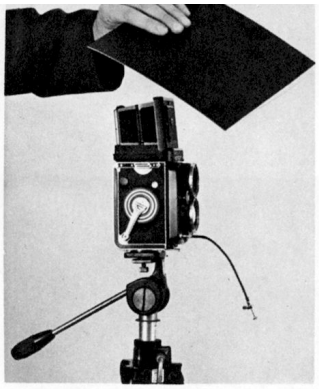
Here's an emergency procedure you can follow when you want to use the bulb setting and haven't got a cable release with you. Hold the shutter release down with a comb or a stick, and brace this at one end with a heavy object, such as the stone shown here. When you end the exposure, be sure to remove the comb or stick carefully so as not to jar the camera.

Joseph Costa made this dramatic time exposure of a shipyard at night, using the lights in the scene as his only illumination. To take the picture, he placed his camera on a tripod, set the shutter at T and kept it open for an exposure of 20 seconds, using a cable release. Notice the muted geometric pattern created by light falling on the top surfaces of the crates in the foreground.
[Courtesy New York *Daily News*]

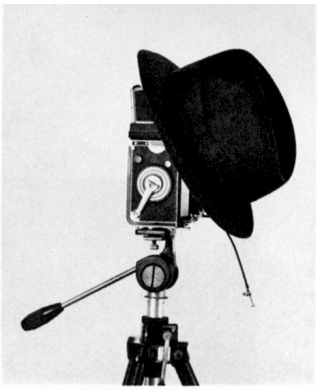


Moonlight was the only illumination available when Victor Keppler took this photograph in the West Indies. He had no tripod with him, so he placed his camera on a rock to steady it. The camera had a bulb setting but he was without a cable release, so he used a comb to hold the shutter-release button down for the 12-second exposure he wanted—using the emergency procedure we demonstrated on the facing page.

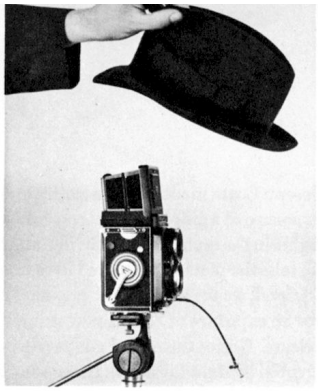
When you want to make several exposures on the same film frame while the shutter remains open, a good method is to block the lens with a black card between exposures, as the photographer is doing here.



When you make the next exposure, remove the card. In this way you can make multiple exposures without touching or shaking the camera in any way.



If considerable time is to elapse between exposures on the same frame, you may find it more convenient to hang a hat over the lens to block off the light.



When the exposure is to resume, remove the hat *very gently*, being extremely careful not to jar or shake the camera.

The open-shutter technique of time exposure

The conventional use of the time or bulb setting we've just described is not the only way you can make long exposures. The *open-shutter* technique, which we demonstrate above, can serve the same purpose. It has this advantage: If a car or some other object moves past your lens during the exposure, you can cover the lens and keep the object from being recorded on the film. The open-shutter technique also lends itself to making *multiple exposures*—more than one exposure—on the same piece of film.

You can use either the time or bulb setting with this method. The only special equipment you need is a dark hat or a black card for covering the lens. [If they are not dark, they may reflect light rays back through the open lens.]

Hold the card or hat in front of the lens and open the camera shutter, using the cable release already described. If your camera has a bulb setting, you should have a locking cable release. To start your exposure, merely remove the hat or card to let the light pass through the lens to the film. To end the exposure [or any part of it, if you're making a multiple exposure], just put the hat or card back in front of the lens. Any time something passes between the camera and the subject, you can temporarily halt exposure by covering the lens in the same way. When your single or multiple exposure is complete, close the shutter. Of course, when you place the hat over the camera, you must be careful to do it *very gently* so that you don't jar the camera.

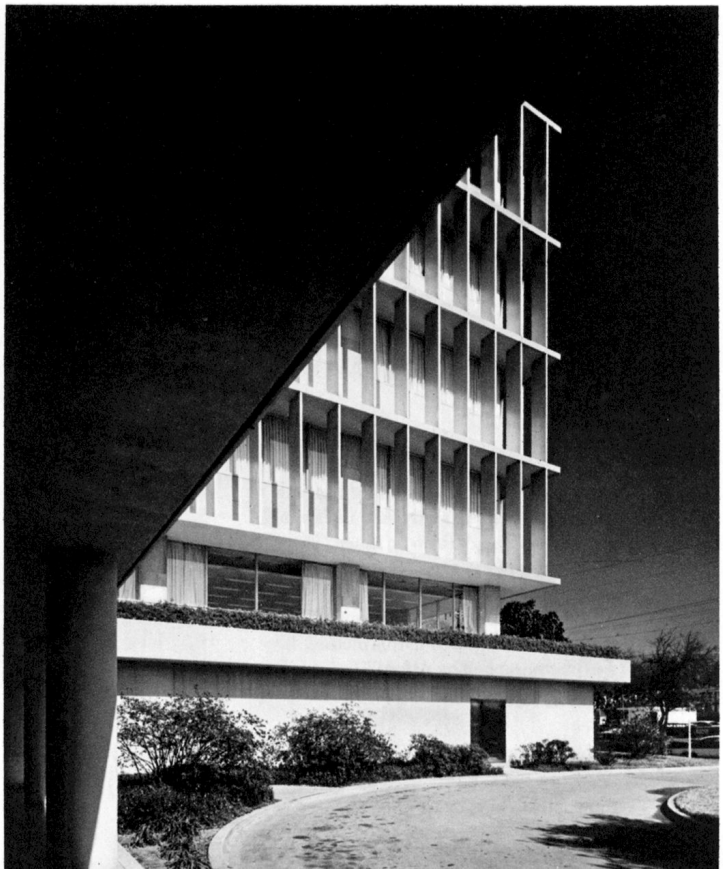
Philippe Halsman used two time exposures to create this unusual photograph of New York's First Avenue and the United Nations headquarters. He made the first exposure shortly after the sun had set, to get the detail in the sky. Then he covered the lens for a while. He made the second exposure when the cars were traveling along the drive with their headlights on—producing the ribbons of light shown on the right. This is a good example of multiple exposure used to achieve an effect that a single exposure couldn't.

How your Guiding Faculty uses outdoor light

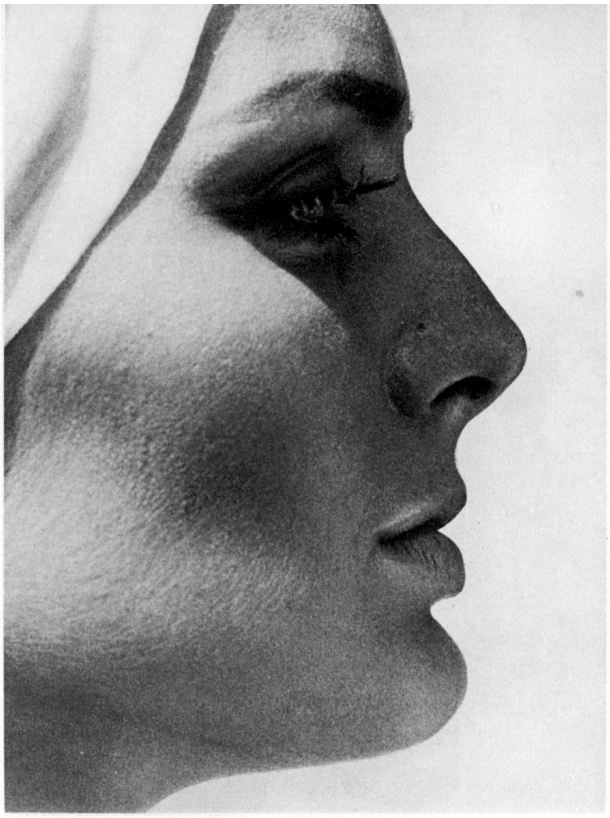
One of the marks of a good photographer is how he uses the many varieties of light—to evoke emotional response, to reveal form and texture, to emphasize important details and subdue less important ones, and to strengthen his pictures' meaning and impact. On the next few pages you will see examples of how members of your Guiding Faculty apply the principles of outdoor lighting which we have demonstrated. On this page and the next are pictures made with front- and sidelighting, and on the following pages we show you Faculty examples of the use of backlighting, both in landscapes and portraiture. Finally, there are pictures that demonstrate the subtler effects that can be obtained with soft, more diffused daylight. Although these examples by no means exhaust the rich possibilities of daylight photography, they do emphasize some of the more interesting and creative ways you can use outdoor lighting in your own pictures.

Richard Beattie's advertising photograph of a rugged-looking mountain climber was made with 45-degree sidelighting. In this case, however, the light was at a 45-degree angle in relation to the camera, but not to the man's face, which was turned toward the sun. High, almost full, frontlighting on the face, with the characteristic "butterfly shadow" under the nose, is the result. By having the man look directly into the light but shooting the picture from one side, Beattie was able to show considerable form-defining shadow on the face and bring out the square, manly outline of the jaw.
[Courtesy Camel Cigarettes, R. J. Reynolds Tobacco Co.]

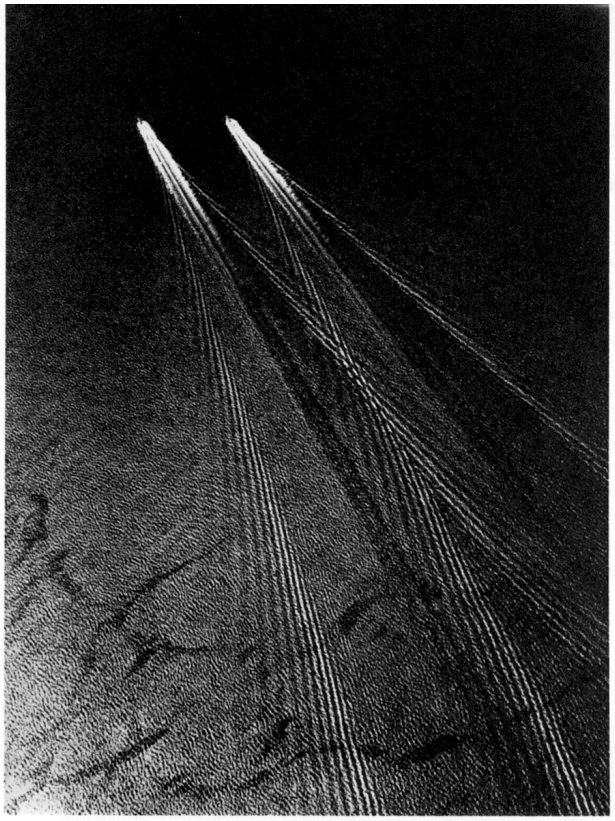
Strong 45-degree sunlight adds impact to this view of skyscrapers by Arthur d'Arazien, revealing the form and texture of the metal and stone buildings. The lighting brightly illuminates the planes facing the sun, and throws the sides of the towers into dark shadow. The clear demarcation of different plane surfaces emphasizes the feeling of solid form. The light skims past the shadow sides, catching on projections and accenting the black shadows with a pattern of highlights. Notice the shadow of a neighboring building cast on the front wall of the nearest skyscraper. It serves an important compositional purpose, tending to lead our eyes into the picture. Remember, when photographing by strongly directional lighting, the shadows, too, are a crucial part of your composition. Make them work with you, not against you.



Ezra Stoller often uses bright sunlight in his architectural photographs to display the form of buildings. In this composition he was able to create an arresting pattern of highlights and shadows and show the structural details of the building clearly by choosing the right lighting and angle. See how the high, approximately 45-degree sidelighting throws the porch area at the left into deep shadow, turning it into a dramatic frame which directs the eye to the other section of the building.



Here Bert Stern has used sidelighting for a portrait in profile. The strongly directional light, coming from above and to the left, models the surfaces and contours of the girl's face, and emphasizes the texture of her skin in a departure from the usual approach. Notice that the girl's eyes, nose, lips, and chin are in shadow. Obviously the effect would have been quite different if she had been facing the camera or the light. When you make portraits in highly directional light, pay particular attention to the angle of the head in relation to the light–this is an important factor which you can use to create the lighting effect you want.



This is an aerial shot of two speedboats cutting through a placid sea–but it almost looks like an abstract design because of the ingenious way Joseph Costa used the directional sidelight from the late afternoon sun. Because the light source was low, each small wave and ripple casts a shadow, giving the surface of the water a textural quality. The white wakes and the larger waves produced by the boats are also clearly defined, and add a powerful diagonal movement to the composition. [Courtesy New York *Daily News*]

Strong, high lighting from a tropical sun gives a sculptured quality to the straining muscles of these African boatmen. The splashing water glistens brightly, and the slight motion blur in the arms and paddles contributes to the feeling of violent effort captured in this picture. It was photographed by Alfred Eisenstaedt. [Courtesy *Life* magazine, ©Time, Inc.]

Backlighting for dramatic effect

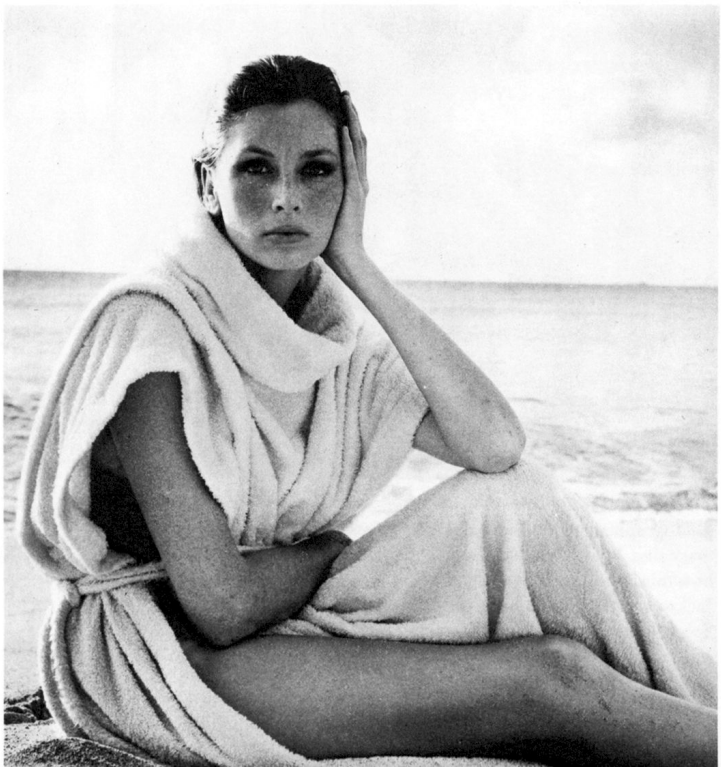
Used imaginatively, backlighting can be one of the most dramatic and mood-provoking types of outdoor illumination. In many ways it is a theatrical kind of lighting, because of the forceful contrasts and patterns of highlights and shadows which it can create.

Backlighting is excellent for giving both depth and dimension to your pictures. Frequently, it illuminates the background and separates objects from it by covering them with shadow. The strong emphasis this gives them seems to thrust them into the foreground. In portraiture, as we have demonstrated, backlighting can provide a soft, flattering light on the face.

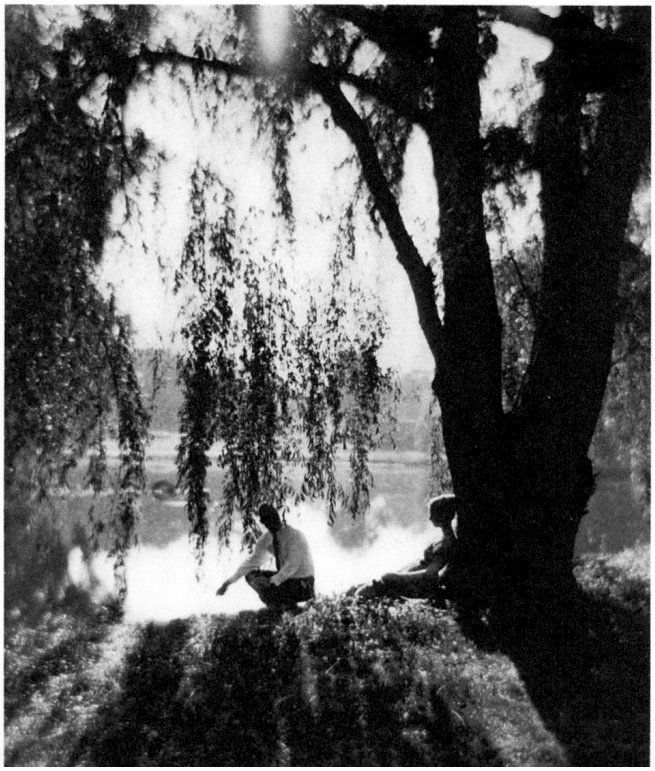
Here you see how Faculty members Joseph Costa, Richard Avedon, and Richard Beattie have used different kinds of backlighting to photograph subjects as varied as trees and a city skyline.

Joseph Costa's aerial view of Manhattan is made dramatic by the strong backlight emerging from behind the clouds and outlining their interesting dark shapes with light. The highlights on the water lead the eye back into the picture, where the skyline of the city rises in hazy silhouette on the horizon.
[Courtesy New York *Daily News*]

In this backlighted portrait of model Suzy Parker, Richard Avedon used a white cardboard reflector to throw soft, gentle light into the shadows on her face and body. He did this because he wanted to lighten the shadows so that when he exposed for them he would not greatly overexpose and "burn out" the background. [For this picture he needed a suggestion of beach and sky to establish the surroundings.] However, if you wanted to subdue distracting background detail, you normally would *not* use a reflector, but would base your exposure on the somewhat darker shadows of the backlighted person and let the background go overexposed.
[Courtesy *Harper's Bazaar*]



Backlighting can help greatly in creating an atmosphere of romance and nostalgia, as this pastoral scene photographed by Richard Beattie illustrates. The sun glistens through the cascading foliage of the tree and shines off the surface of the water, in brilliant contrast to the dark shape of the tree and the long shadows on the grass. The man and woman are almost silhouettes, and Beattie has posed them so that their outlined shapes are interesting and meaningful. When you use backlighting for silhouette effects like this, be sure that the shapes of important objects are clearly defined and recognizable.

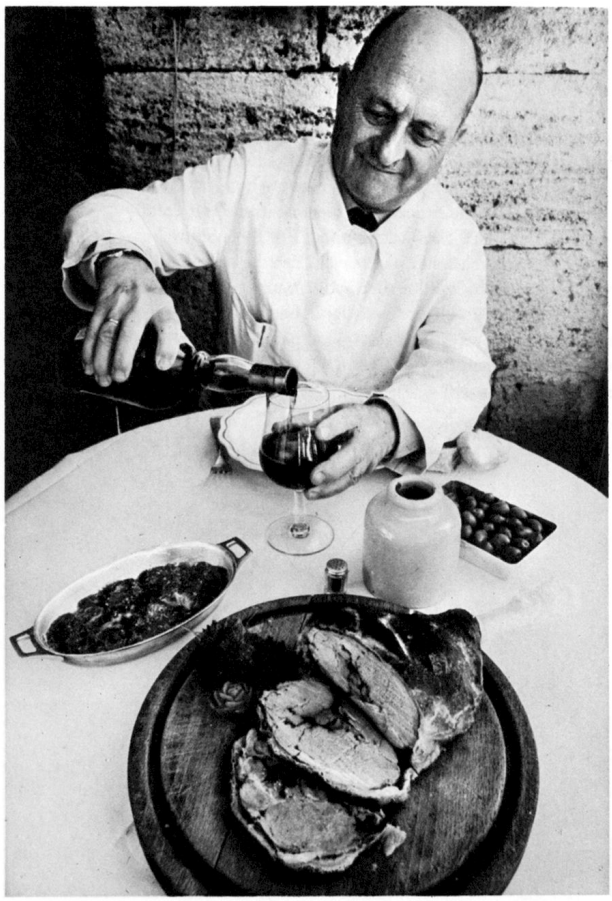


Diffused lighting for subtle effect

The soft lighting of open shade, or of a hazy or overcast day, is a favorite type of outdoor illumination with the members of your Faculty. The ability of this diffused light to model the subject subtly, without unpleasantly harsh contrast, makes it an excellent choice for many kinds of subjects. With it, you never face the problem of trying to show detail in deep shadow areas, because there are no deep shadows. For this reason, it is often preferred by fashion photographers, whose job it usually is to show clear detail in clothing. Others like it, also, because it makes for effortless shooting, with only one exposure setting, regardless of how the subject is turned or your choice of camera position.

The light of a hazy bright day–soft but directional–was just right for the gentle mood Harry Garfield was seeking to create. The illumination is from the back, but enough of it falls on the little girl's face to model its soft, round form. See also how the bright light shining on the dandelion makes it stand out against the background. Our attention is drawn immediately to the story-telling face and flower.

Richard Avedon used the light of an overcast day to take this animated fashion shot. The model's umbrella and the puddle over which she is hopping show us the kind of weather it is, and so does the light. Note that while the light is soft, it comes from the right and emphasizes the contours of the coat–which is the real subject of this picture.
[Courtesy *Harper's Bazaar*]



French restaurant-owner Raymond Thulier plays the host in this photograph made by Irving Penn for an essay on Provence in *Look* magazine. Wisely, Penn chose the soft, even light of open shade. Note how this light gently models the shape of Thulier's head, hands, and jacket, and the objects on the table. The absence of strong shadows keeps the emphasis where it belongs–on the man and his meal. Dark shadows would have competed with them for attention if Penn had taken the picture in bright sunlight.
[Courtesy *Look* magazine]

The light on a rainy day often has a mood-evoking quality—it is a soft light but it still clearly reveals form, value, and textures. Richard Avedon has used this kind of illumination for his sensitive portrayal of a young woman and her cat at a window. Although the light is diffused and low in contrast, it creates subtle shadows that model her hands and face and the head and the white fur of the cat. Raindrops running down the windowpane pick up bright highlights, while the shadow areas in the room behind the woman merge into black. The thoughtful expression on her face and the somber light add to the quiet mood. [Courtesy *Harper's Bazaar*]

Making the most of outdoor lighting

As you have gone through this lesson, you may have been surprised to find how varied outdoor lighting is and how many exciting things you can do with it. Outdoor photography has endlessly thrilling possibilities, but you can only really begin to understand them when you have a camera in your hands. Put the theory of picture making into practice as soon and as often as you can.

If you want to learn how to make the most of outdoor lighting, don't practice just the techniques that look simple or that appeal to you. Explore and study *all* the techniques demonstrated in this lesson. A systematic trial of each will give you a good familiarity with the different types of lighting, so that soon you will begin to choose the best camera angle or the most sensible technique of contrast control without having to experiment with many alternatives. In other words, your sensitivity to the light will become second nature, just as the operation of your camera and its controls should be.

Still another way to learn much about outdoor lighting is to study closely the pictures of both good photographers and inexperienced ones. You can benefit by seeing how they used—or failed to use—lighting to help their photographs. Examine each picture carefully and then ask yourself these questions: Where was the light coming from? How would a change of direction have affected the picture? Was the light concentrated or was it diffused? Could the picture have been improved by changing the position of the subject? Would the use of a fill-in flash or reflector have made a noteworthy difference?

These are just a few of the points to consider. Your final query might be this: How could the picture have been improved by using the light differently? If you study some of the excellent photographs found in the picture annuals, top picture magazines, and in some national advertisements, as well as the work of your Faculty members in these lessons, you will probably conclude that the light was used to maximum advantage. The reason is that the best professional photographers have learned how to see the light and to use it wisely when making their pictures.

Good photographers *know light*. They know that at dawn they can get soft, low-contrast effects before the sun is above the horizon. In the early morning hours they may use the slanting rays of the low sun for dramatic backlighting or for textural effects. They find the midmorning light that comes down at a 45-degree angle a good all-around light for general shooting—especially for landscapes and architecture.

As the sun begins to drop in midafternoon the shadows grow longer and texture and modeling are once more easily emphasized by side- or backlighting. Skilled photographers frequently like to use the setting sun for dramatic pictures—especially with color film, which records the warm golden tones of light so beautifully. Twilight means another opportunity for unusual pictures—and again particularly in color—because it provides a soft and delicate blue-toned light which can create a mood very different from the one you get with the normal color effects of midday exposures.

Try to make the light fit the subject

The types of daylight are many, and they make picture-taking a pleasure. Once you begin trying the different kinds of light, you may be tempted to use them indiscriminately, without relating them to what you want to capture on film. You'll get far better results, however, if you remember this important principle: *Try to make the light fit the subject.*

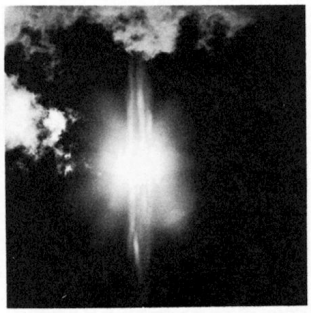
Certain kinds of daylight simply aren't good for taking certain kinds of pictures. One example, we have seen, is bright toplighting, which is unflattering in photographs of people, since it leaves deep shadows under the eyes, nose, and chin, and reveals skin blemishes too clearly. For portraits, we have learned, the diffused light of open shade or a hazy bright day is much kinder.

But suppose the subject is a landscape, and the lighting is strongly directional and coming from the front. If we shot with the sun behind us, the picture would probably look like thousands of others. The ideal choice would be to wait until later in the day, when the sun is at a lower angle. Often, however, this is not possible. What we can change at that moment is our camera angle. Sometimes we can take up a new position, so that the scene is back- or sidelighted instead. The simple step of moving around can make an entirely different and more appropriate picture. All at once, the picture can take on a distinct mood and character.

When you must shoot fast

The picture-taking situations we've been talking about are those in which you have a maximum amount of time to consider your subject before shooting—to study the light carefully and make it work to your advantage. Often enough, however, you will encounter situations where the light will be less than ideal. For example, your camera position may be bad, but the only one feasible, or the light may be coming too strongly at your subject and casting deep shadows where you do not want them. Still, in spite of these handicaps, a good picture may result. The reason is that factors other than lighting can prevail.

As crucial as light is, it is not always the most important consideration in photography. If you have a chance to capture a wonderful but fleeting expression, a moving figure which suddenly makes a fine composition but is about to unmake it, or anything else that requires you to shoot the picture at that moment, you cannot afford to hesitate. The combination of perfect lighting and the perfect moment for shooting does not always present itself, so you must make the most of your opportunities and take the picture when you can. Use the contemplative approach, studying the light when you have time to do so. But when the situation calls for quick shooting, shoot fast!



Technical notes on the photographs

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Alfred Eisenstaedt; Leica with a 35-mm lens; Super-XX film; 1/100 second at *f*/8; daylight.

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Philippe Halsman; Rolleiflex with a 75-mm *f*/3.5 lens; Super-XX film; 1/50 second at *f*/4.5; daylight.

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Richard Avedon; Rolleiflex with an 80-mm *f*/2.8 lens; Plus-X film; medium yellow filter; 1/250 second at *f*/8; daylight.

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Ezra Stoller; 8x10 Deardorff with an 8¼-inch lens; Super Panchro-Press, Type B film; dark yellow filter; 1/5 second at *f*/32; daylight.

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Ezra Stoller; 8x10 Sinar with a 6½-inch lens; Super Panchro-Press, Type B film; dark yellow filter; 1/5 second at *f*/32; daylight.

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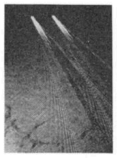
Bert Stern; Hasselblad with a 150-mm lens; Tri-X film; 1/30 second at *f*/8; daylight.



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Joseph Costa; 5x7 aerial camera with a 10-inch lens; Super Panchro-Press, Type B film; 1/400 second at *f*/6.3; daylight.

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Alfred Eisenstaedt; Leica with a 50-mm lens; Plus-X film; 1/200 second at *f*/8; daylight.

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Richard Avedon; Rolleiflex with an 80-mm *f*/2.8 lens; Plus-X film; 1/60 second at *f*/8; daylight.

Famous Photographers Course
Famous Photographers School, Inc., Westport, Connecticut

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Richard Beattie
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Bert Stern
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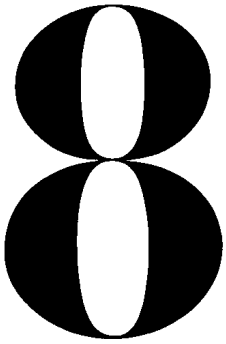
Lesson



Indoor lighting

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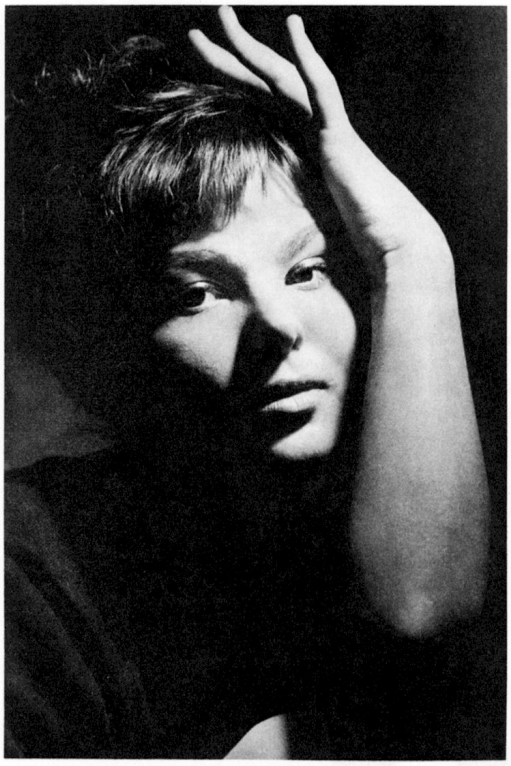


Spotlight: Bert Stern
[Courtesy *Vogue*, ©1962, Condé Nast Publications, Inc.]

Electronic flash: Philippe Halsman

Available light: Alfred Eisenstaedt
[Courtesy *Life* magazine, ©Time, Inc.]

Available light: Alfred Eisenstaedt [Courtesy *Life* magazine, ©Time, Inc.]

Floodlight: Richard Avedon [Courtesy *Harper's Bazaar*]

The art and technique of indoor lighting

Indoor photography is the mainstay of many professionals. A quick look at the pages of almost any magazine or newspaper will show you the scope of indoor shooting: portraits, fashion shots, advertising pictures, photographs of children and pets, step-by-step picture stories on everything from baking a cake to building a boat, to give just a few examples. The varieties of indoor pictures are practically unlimited–and so are the opportunities they offer if you acquire the skills needed to make them.

A key aspect of indoor photography is lighting. To be a versatile professional, you need to be as much at ease handling artificial light sources indoors as you are outside, shooting by sunlight. You'll need a thorough working knowledge of floods, spots, flash, and available light.

Many of the things you have already studied about lighting in the previous lesson hold true indoors as well as out. For example, what you have learned about the direction and quality of light will apply, no matter what the light source. However, there are special methods required for successfully handling indoor lighting equipment. We'll introduce you to these basic working methods in this lesson and show you how to apply them to your own shooting.

The time to begin developing your skill with indoor lighting is now. The methods you learn here will prove important to you all through the rest of your Course–especially in the lessons on portrait, still-life, industrial, advertising, fashion, and press photography as well as photojournalism and editorial illustration. Later on, as a working professional or a serious amateur, you will find many occasions when this skill and knowledge will be indispensable to you.

Three basic types of indoor lighting

There are three basic types of indoor lighting for photography–floodlights and spotlights, flash, and available light. Each has its own strong points and weak points, its most appropriate uses, and its particular effects.

Among many professionals, the most commonly used type of artificial illumination for indoor photography includes *floodlights* [known as floods, for short] and *spotlights* [also called spots]. These are powerful lighting units which work from ordinary electric current, like household bulbs. They include a reflector, which concentrates the beam of light and points it in a certain direction. Spots provide the most intense, concentrated type of light, while floods give a somewhat broader beam.

Floods and spots are available in an inexpensive form primarily designed for amateur use, and in more elaborate models for professional studio use. For the indoor photographer, they are basic tools in creating the lighting effects he wants. As you acquire skill in handling these units, you will be able to combine them in different ways to create natural-looking lighting schemes, to make commonplace subjects dramatic or glamorous, to emphasize or subdue particular details, and to evoke various moods and emotional responses. Of all the types of artificial light, spots and floods offer the greatest degree of direct control.

A second basic type of lighting is *flash*. With flash you often can produce results very like those you get with spots and floods. However, the techniques of using the equipment are somewhat different. Flashbulbs provide a strong, "one-shot" source of illumination which throws a powerful but fleeting light on the subject. You must therefore time the flash carefully to coincide with the opening of the camera shutter. Most flashbulbs are fired by current supplied by a battery [or a battery-plus-condenser combination]. Flash is much more portable than studio flood and spot equipment, and you can use it where there isn't any electrical current. This makes flash especially valuable to press photographers, photojournalists, and industrial photographers when working outside their studios.

In recent years *electronic flash* has become increasingly popular among both professional and amateur photographers. Unlike conventional flash, where a bulb is fired once and then discarded, you can use the electronic-flash unit repeatedly without changing the bulb. In addition, the flash is extremely brief. It blinks on and off at a speed of 1/500 to 1/2,000 second with portable units, and at a speed of up to 1/10,000 second or even faster with large studio units. Thus electronic flash often is chosen by photographers who want to stop fast action.

A third type of indoor illumination uses no photographic lights at all. This is called *available light* because the photographer relies only on the illumination that exists in the location where he is shooting.

Available light was once used only by a handful of photojournalists who valued the natural and beautiful effects it could yield and the freedom it gave them to shoot candid, unobserved pictures. Today an increasingly large amount of press, industrial, public relations, and other kinds of photography is shot by available light. More than just another technique, available-light shooting embodies a whole philosophy of photography. You should have a basic knowledge of available-light methods because many subjects can best be shot by this kind of light.

A sensible approach to indoor lighting

All three basic types of indoor lighting are tools that can help you to create the kind of picture you want. The results you can achieve with indoor lighting are greatly varied, so it's important to analyze your picture situation in terms of what you want the lighting to accomplish and then select the type of lighting that will best serve your purpose.

Methods of using flash, floods, spots, or available light differ widely. Some photographers, for example, prefer to exercise the greatest possible control over lighting. Their goal is not to copy nature but to create a mood or effect. Other photographers tend to keep their lighting as unobtrusive as possible and strive to achieve a natural and spontaneous result. A few refuse to use any artificial illumination at all and insist on shooting everything by the light "as is."

As you work with flash, floods, spots, and available light, you will discover which techniques and approaches are most natural and effective for you. Just as you visualize pictures in your own way, so you will tend to develop your own personal style of lighting in your photographs.

It will help you to develop your skill in indoor photography if you don't start out with any prejudices for or against a particular type of lighting. Give each a fair chance, experiment with it, and discover the things you can do with it.

For example, even a devoted available-light photographer can benefit greatly from working carefully with floods in a studio situation. This can sharpen his ability to recognize evocative kinds of lighting in different locations, or to modify the lighting so it will do a better job for him. Likewise, even if your greatest interest lies in studio photography, experience with available light can suggest beautiful, dramatic, and natural lighting schemes that you can adapt to a controlled lighting situation.

Light is light whether its source is a flashbulb, a spotlight, a room lamp, or the sun itself. Although it is endlessly varied in the effects it can produce, it always can be evaluated in terms of intensity, direction, and quality. Concentrate on these fundamentals and how to control them, as we demonstrate in this lesson, and you should be far better able to use light intelligently in any picture-taking situation you encounter.

Working with floods and spots

The best way to learn indoor lighting is to set up a small home studio with a few studio lights and find out by practice how they work. Only by actually moving the lights around and using them will you be able to see and understand how they can influence your photographs. With floods and spots you can immediately see the effect you're getting. Of all types of indoor lighting, they are the easiest to control, and therefore the logical ones to begin with. Later, you can adapt what you've learned with floods and spots to flash photography and even to available-light photography.

Almost any room with white or light-colored walls and a white ceiling can be suitable for a temporary "studio." Part of your living room or any other room in the house can serve this purpose, if furniture can be moved out of the way to give you clear working space. You should have enough room to move your lights about six to eight feet from the subject, and the camera about ten to 12 feet.

A plain wall itself can serve as a background. If the wall has striped or patterned wallpaper, you can easily rig a plain background by hanging a smooth sheet against the wall, using a roll of white seamless paper, or a wide window shade. The background material can be attached by thumbtacks or tape. Whatever material you use, be sure it lies smooth and flat. Wrinkles or bumps can cause unpleasant and distracting shadows.

You'll find a good sturdy tripod is an almost indispensable accessory for much of the "studio" photography you do. Of course, you can rest your camera on a chair or table, propping it up on books if necessary to get the right height. But a good tripod gives you much more precise control over camera height and angle. Therefore, if you haven't already obtained one, we recommend that you do so at this point in the Course. Also, use a lens shade on your camera for all your indoor photography. It's an important safeguard to help keep the light of floods or spots from shining directly into your lens and causing flare–blobs or streaks in the picture made by rays of light reflecting off the inside surfaces of the lens.

The lighting equipment you use for indoor photography will vary, of course, according to the needs of the picture. The best advice that we can give you is to *start with simple equipment and then add more as you need it.* The illustrations on these two pages show you some of the common types of studio lighting equipment and accessories that you're likely to encounter in your work as a photographer.

Your basic lighting kit

A good basic lighting kit to get you started includes the following:

Three reflector-type photoflood bulbs or three photoflood bulbs plus metal reflectors. These give a broad beam of light.

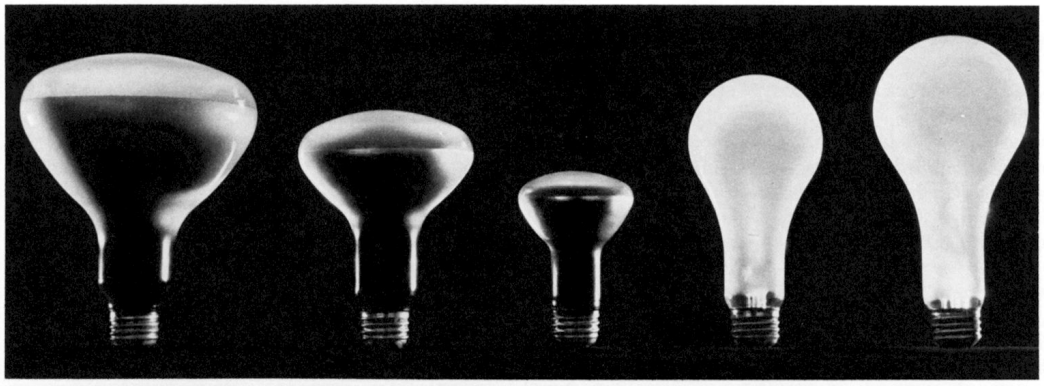
One reflector-type spotlight or a small spotlight unit. These give a relatively narrow beam of light.

Three or four clamp-on units. These consist of a socket, electrical cord and plug, and a clamping device. They are used to attach your photoflood bulbs to light-stands, the back of a chair, the edge of a door, or other support.

Four light-stands to hold your three floods and one spot. The lightweight, telescoping, collapsible types of stands are good. They are easy to move, can be folded up for storage in a small space, and are convenient to carry when you have to work away from your studio. [Larger, heavier light-stands are necessary only for holding large professional studio floods and spots.]

An adequate supply of heavy-duty extension cords and multiple-outlet plugs so that you can move your lights around freely.

A large [16x20 or larger] sheet of white cardboard to use as a reflector. Cover one side with aluminum foil that has first been crumpled and then flattened out. This gives you an alternate, brighter reflecting surface.



Bulbs for photographic lighting

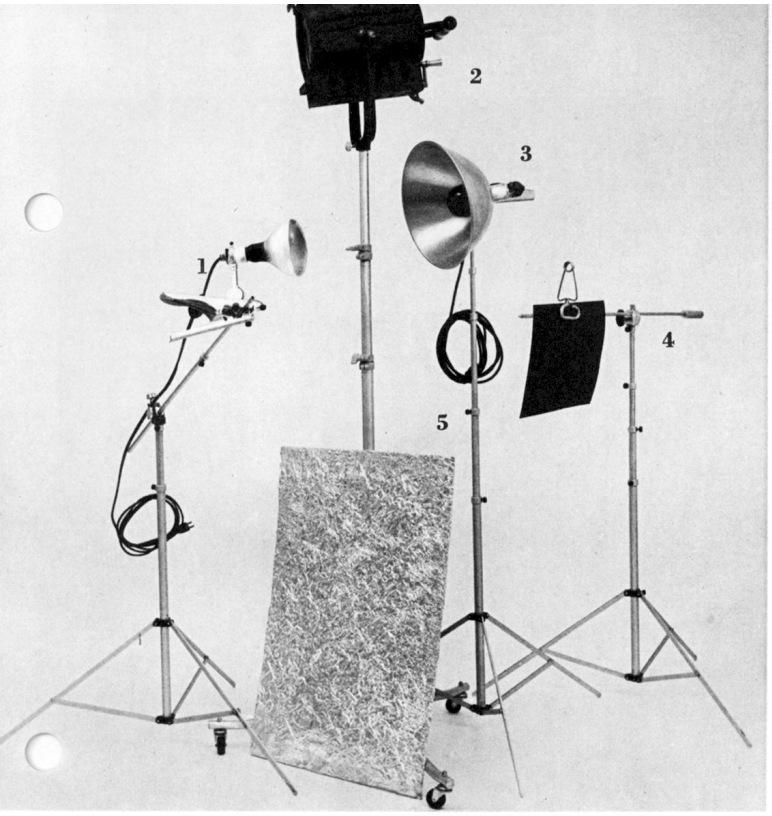
There are two kinds of bulbs for indoor lighting–photoflood bulbs [which produce a light of 3400K], and bulbs designed for use with professional studio equipment [which give a light of 3200K]. The nomenclature of photographic lighting equipment varies. Some manufacturers call these bulbs "lamps." However, we will use the word "bulb" throughout this Course.

Photoflood bulbs [also called *photofloods*] have either a built-in reflector or they are standard photoflood bulbs designed for use with a separate reflector. They give a brighter light than household light bulbs [and also have a relatively shorter usable life]. The 3400K light is slightly cooler than that from studio bulbs and can be used with Type A color-transparency films without filtering.

The three mushroom-shaped bulbs shown above at left are reflector photofloods. The inside surface of the bulb's sides has a silver coating that acts as a reflector and directs the light in a beam. These bulbs are available in a variety of wattages. For example, the three shown here are, left to right, 500-watt, 375-watt, and 200-watt bulbs. Reflector-type bulbs also are available in a design that throws a narrower beam, for a spotlight effect. This type of reflector bulb is called a *photospot.* Photofloods and photospots are compact and convenient because they do not require an additional reflector. However, they cost more than do standard photoflood bulbs.

The two bulbs shown at right are standard photoflood bulbs of 250 and 500 watts. They are designed to be used in a metal, dish-shaped reflector that directs the light in a broad floodlight beam. Many photographers prefer them over reflector-type bulbs for more permanent installations because the cost per bulb is less and because the metal reflector may allow more precise control over lighting effects.

The 3200K bulbs [not shown] come in a variety of sizes and wattages. They are somewhat more expensive than conventional photoflood bulbs, but have a longer life. They are used in large studio flood and spot equipment and with Type B color-transparency films.



Light-stands and equipment

Light-stands in combination with clamp-on holders can hold a variety of lights and accessories. Shown at left are:

1 A collapsible light-stand with an extension arm holding a reflector photoflood on a clamp-on holder. Since the stand may be extended to a higher position, it can be used to direct the light from virtually any angle on a subject of ordinary size.

2 A small focusing studio spotlight on a heavier light-stand. This spot can be utilized when strong light is desired for only a small area of the subject [for example, the top and side of a girl's hair in a portrait].

3 A collapsible light-stand with a standard photoflood bulb in a metal reflector. This gives a broader, less intense beam of light than the spotlight, and can be used to light wider areas.

4 A collapsible light-stand to which is clamped a *gobo*–a piece of opaque cardboard used to block off light from a particular part of the scene or to prevent stray light from creating flare.

5 A reflector made from crumpled aluminum foil fastened to a piece of cardboard. This is used sometimes in the same way that you learned in the lesson on outdoor lighting–to brighten shadow areas.

The studio spotlight [No. 2 in the illustration] is a fairly heavy and expensive piece of equipment for the beginner. Yet you may eventually want to acquire one because it enables you to get a wide variety of effects and is particularly useful in doing still lifes and portraiture. It can be focused accurately on a particular area, which cannot be done with the built-in reflector photospot bulbs, and it will take a number of accessories such as snoots, barndoors, and diffusers [shown in the picture below].

Light controls

Here are three units used to control the light from floods or spotlights:

1 A *barndoor*, which consists of hinged flaps that can be adjusted to control the width of the beam of light. This one is mounted on a reflector photoflood. As you can see, it will tend to give a narrow beam of light.

2 A *diffuser* or *diffusion screen*, which is simply a piece of spun glass, fiber glass, cheesecloth, muslin, or any other suitable material, mounted on the front of the reflector [and *never touching the bulb*] to give softer, less directional light. You can easily make a diffusion screen or you can buy one ready made.

3 A *snoot*. This is a cone used to direct the light to a small, specific area of the subject. In the illustration it is mounted on a studio spotlight. You can make your own snoots from black construction paper and masking tape.

While you don't need these accessories for your basic lighting setup, you may want to add them to your equipment after a while. Their use will be covered in more detail in later lessons.

How many lights can you safely use?

Of course, you will also need an adequate supply of electricity. You should be careful not to overload the circuits available to you–in your own home or when shooting on location.

To find out how many lights you can safely use at one time on a particular circuit, there is a simple formula:

The voltage [of your electrical circuit] times amperage [which the fuse on the circuit permits you to draw] equals the wattage [the maximum number of watts you can put on that circuit without blowing a fuse].

Since most household fuses are for 15 amperes and the average household circuit carries a current of 110 volts, this would mean that the maximum wattage you could use is 1,650 watts [provided no other lights or household appliances are on and drawing from the same circuit]. However, to be on the safe side, it's a good idea to keep the wattage on one circuit *under* 1,500 watts. For example, you could use two 500-watt bulbs and one 250-watt bulb.

Remember, also, that most houses and apartments have more than one circuit, each of these operating off a different fuse, and that by using extension cords you can often put different lamps on different circuits. If this is possible, keep the wattage on each circuit at about 1,000 watts so that you do not run the risk of suddenly blowing a fuse in case a heavy appliance such as an electric heater turns on. Also, be sure to use *heavy-duty* extension cords. Floods and spots may be used with either alternating or direct current [AC or DC].

Controlling the quality of studio lighting

When you use floods and spots, one of the first things to familiarize yourself with is the different qualities of lighting you can get. By quality of lighting we mean whether the light is concentrated and strongly directional [throwing sharply defined shadows] or relatively soft and diffused [throwing less distinct shadows].

In a studio, you have a great deal of control over the quality of your lighting. By choosing a spotlight, floodlight, or some method for diffusing the light, you can create any lighting effect you want, from very harsh and contrasty to extremely soft. The three accompanying photographs demonstrate this range of effects using a very simple subject–a cup and saucer.

A spotlight throws the most concentrated beam of light, and produces small, sharp highlights and dark, sharp-edged shadows.

A floodlight throws a wider beam, producing somewhat broader, less intense highlights and softer shadows.

Diffused light is the softest of all, with indistinct shadows or almost no shadows. You can achieve this effect by placing a diffusion screen in front of a floodlight, by reflecting a floodlight off a wall or ceiling, or by using a large bank of lights.

Regardless of the light source you use, *the further it is from the subject, the smaller the highlights and the sharper edged the shadows will be.* For example, a spotlight used very close to a subject may produce an effect similar to that of a flood. On the other hand, a flood used at a considerable distance from the subject, will produce a harsh, spotlight-type of illumination.

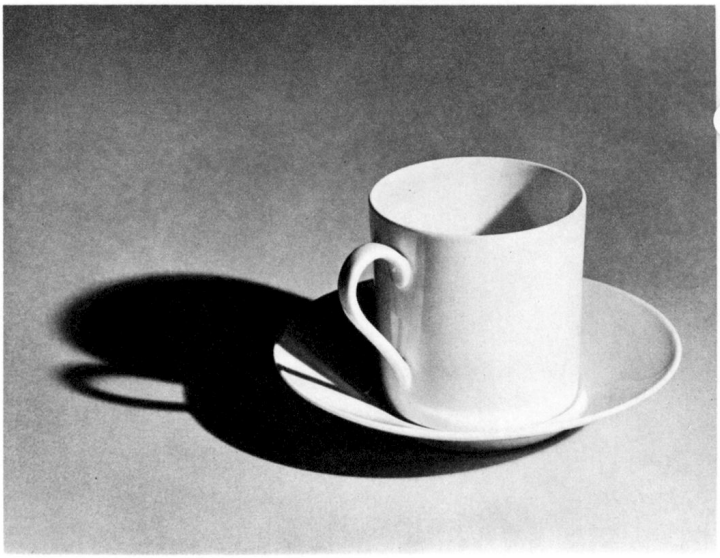
Which effect should you choose? Just as with outdoor lighting, it depends on your subject and what you want the picture to say.

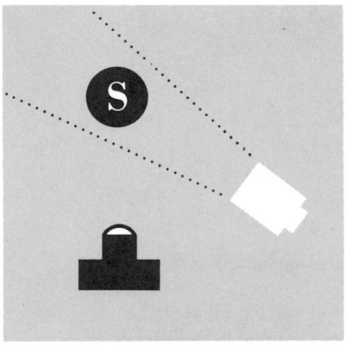
Indoors as well as out, lighting contributes strongly to the mood of the picture. Brilliant highlights and dark shadows are strong and dramatic because of the clash of values. Soft, diffused lighting, on the other hand, conveys a quieter, gentler feeling. Therefore, the emotional effect you want in the picture will be an important consideration when you're choosing a light source.

Also consider whether you want a very directional light or not. You've already seen many of the effects that can be achieved with this kind of lighting. Shadows and highlights are clearly defined. Depending on where you place the light source, you can emphasize form and texture, make a part of the picture stand out by lighting it brilliantly, or conceal unwanted details by throwing them into shadow. The shadows, too, become a significant part of your composition, and can be used to tie together different things in the picture.

With diffused, nondirectional lighting you obtain very different effects. You can subdue shadows or eliminate them altogether. With some portrait subjects–a child or an elderly person, for example–you may prefer soft lighting as more flattering and appropriate. When you photograph an intricate machine or a finely detailed object you may want to eliminate shadows that would be confusing and hide the very details that need to be revealed.

If you've been using your eyes and sharpening your awareness of outdoor lighting, you should have no difficulty in seeing indoor lighting, too, from a creative, photographic viewpoint. And indoors you have the great advantage of being able to control the light source itself–directly and with great precision. As we continue with this lesson you'll see how this can be one of your greatest assets in producing good pictures.





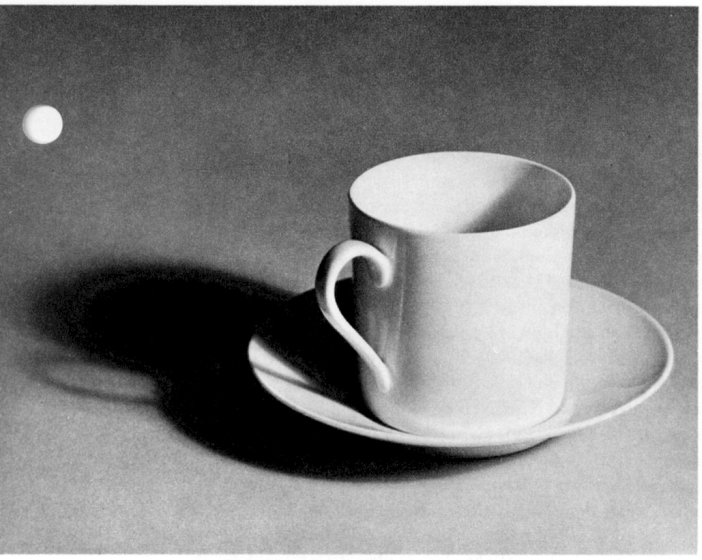
Spotlight

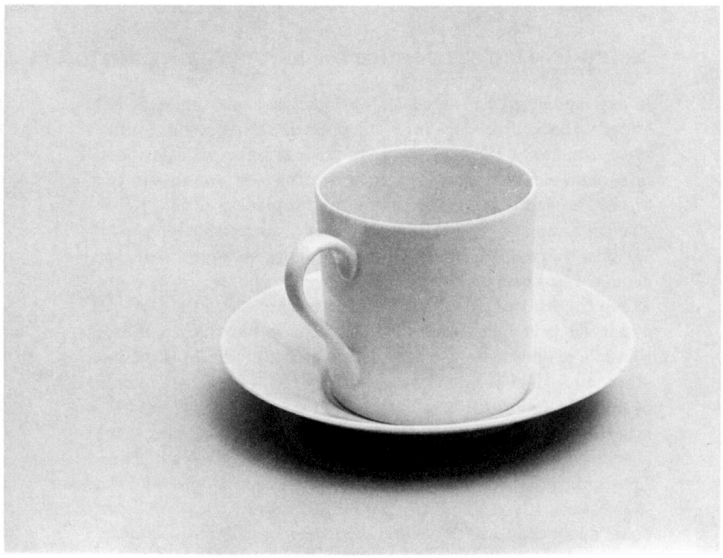
A spotlight throws a relatively narrow, concentrated beam of light. As the diagram above indicates, the light rays are almost parallel. With a true spotlight [this doesn't include photospots because they cannot be focused] you can control the beam of light. By moving the lamp and reflector toward the lens of the spotlight, you can make the beam wider and less intense, approaching a floodlight in effect. By moving the reflector away, you can make the beam narrower and more intense. With the aid of barndoors or a snoot, you can concentrate the beam even more for lighting small objects or areas.

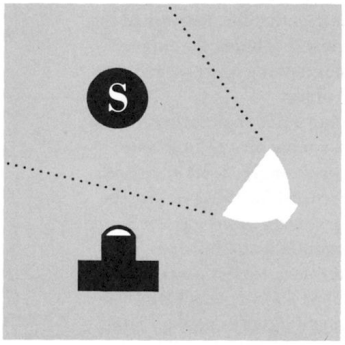
The photograph above was made with the illumination from one spotlight at the right. Notice the bright white highlight areas such as the rim of the saucer and the edge of the cup handle, and the sharp-edged black shadows. There is a well-defined contrast between these highlights and shadows.

Spotlight illumination tends to be dramatic. It suggests theatrical, artificial illumination because natural light rarely is as concentrated as the beam from a spotlight. One or more spotlights can be used alone for powerful effects. More commonly, however, a spotlight is used in combination with floodlights.

A spotlight is particularly useful when you need a concentrated area of light to emphasize a part of the subject. It's often employed to illuminate a precisely limited area of a background, or to add bright accents of light to a portrait subject's hair.





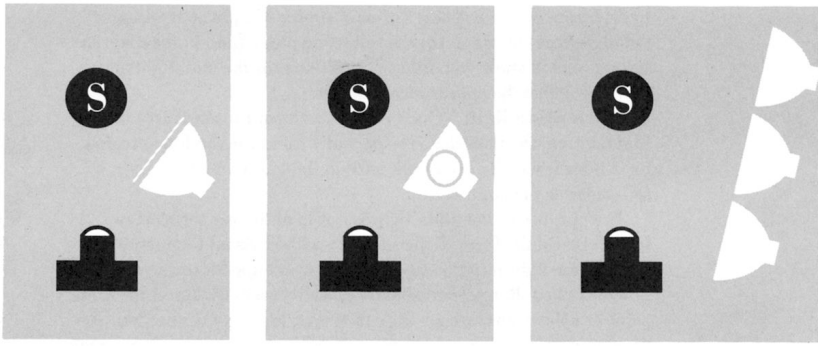


Floodlight

In contrast to the brilliance of a spotlight, a floodlight gives us less concentrated illumination, with rays that diverge [*see the diagram above*] instead of being fairly parallel. Another important difference–a floodlight [either the professional studio type or the photoflood type] cannot be focused.

Compare the cup and saucer above with the photograph made with the spotlight. Notice that the highlights are a little less intense and the shadows are not so black. There is less lighting contrast. Shadows are clearly evident, but their edges are less distinct. The effect is similar to that of bright sunlight outdoors.

Because it is less harsh than a spotlight, yet produces strongly directional lighting, the floodlight is the workhorse of studio light for portraits, still lifes, and many other subjects.



Diffused light

Diffused lighting often is chosen when the photographer wants a gentle, natural effect, even illumination, and minimum shadows. Notice that there are no sharply defined highlights even on the rim of the saucer or on the cup handle. The edge of the shadow is very indistinct and soft.

There are three principal ways you can achieve this type of illumination with studio lighting units:

1. A diffusion screen of some kind can be mounted in front of a floodlight. [*See diagram at left.*] This will soften the light, but the illumination will still be quite directional.

2. The light from a floodlight can be bounced off a reflecting surface such as a light-colored ceiling, wall, or sheet of cardboard. The reflected rays become scattered, thus creating diffused illumination. [*See center diagram.*] This method, known as *bouncelighting*, is a popular and effective way to produce soft, diffused light. The photograph above was made by bouncing the light from one floodlight off a white ceiling. While bouncelighting is directional–it comes from the direction of the surface it is bounced from–it creates soft, indistinct shadows. By increasing the distance between the light source and the reflecting surface you can achieve very diffused, almost shadowless effects.

3. A bank of several floodlights mounted close together can produce diffused lighting. [*See diagram at right.*] This method is most commonly used in larger studios. It can be very effective when you need diffused lighting over a wide area, but obviously it is more expensive than the first two methods.

A step-by-step procedure for arranging studio lights

In any indoor lighting situation in which you can arrange the lights, there is a basic procedure for placing them. This procedure isn't rigid; sometimes only one or two of the four lights we describe will be enough to create the effect you want. However, you should be thoroughly familiar with the procedure for placing all four lights, since this knowledge can be of great help in many pictures you take. Whether you use two lights or several, follow the logical *sequence* demonstrated here.

1 Set the mainlight: This light [sometimes called the *keylight*] will be the principal source of illumination in your picture. Rarely should a photograph–whether it is a portrait, a still life, or an interior –have more than one main source of light, with one predominating set of shadows and highlights. This rule is based on the way our eye is accustomed to seeing natural light and its effects. Outdoors, there is generally only one main source of illumination, the sun; it is this basic light source that determines the position of the highlights and shadows in the scene. If you illuminate the subject with two or more lights of equal importance, the lights and shadows may crisscross in an unnatural, confusing manner, and the picture will not look right.

Therefore, when you illuminate an indoor subject, the first step is to determine where to place the main source of light so it will give you the effect you want. On the following pages [and in the diagram below] we will show you different positions for the mainlight and how they affect the appearance of the subject.

2 Add a fill-in light: Once you have set your main source of illumination, the next step is to partially fill in the shadows created by it. This is usually done with a fill-in light–a light which isn't as intense as the mainlight.

The purpose of the fill-in light is not to obliterate the shadows [which reveal the form of the subject and add visual interest] but to direct some light into them so that they won't appear too strong when photographed. Remember, shadows usually seem darker in the final print or color transparency than they look to our eyes when we view the actual subject. Therefore, fill-in lighting, correctly used, can make the subject appear more natural. Of course, if a very strong contrasty effect is what you want, then you would use little or no fill.

It is essential that the fill-in light should not create a new set of shadows of its own. To prevent this artificial effect of "shadows within shadows," the fill-in light usually is located as close to the camera as possible and at about lens height. In this position it produces "flat" frontlighting.

In locating the fill-in light, make sure that the camera doesn't block it and cast a shadow on the subject. To avoid this you may find it necessary to place the fill slightly higher than the camera or off slightly to the right or left of the camera, on the side *away* from the mainlight. [While this positioning would not give absolutely flat illumination, it still should not create disturbing shadows.]

Unless you want completely flat lighting, be certain that your fill-in light throws less intense illumination on the subject than your mainlight does. You may need to use a weaker bulb for the fill, put a diffusion screen in front of it, or place it at a greater distance from the subject than the mainlight is.

If you place the fill-in light at a greater distance, you may need to move the fill-in light to a position behind your camera, as well as slightly above it or off to one side.

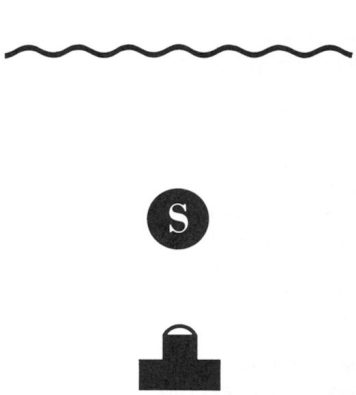
3 Add an accent light: The purpose of this light is to put bright highlight accents on the subject, giving the picture more sparkle and separating the subject from the background. A spotlight often is used as an accent light because of the narrow, controlled beam it throws.

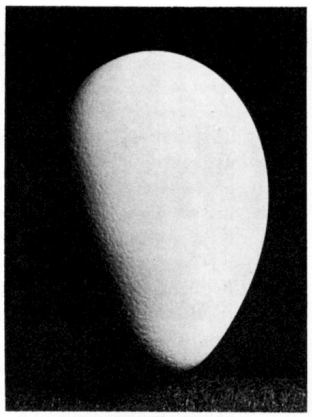
If your subject is dark and placed against a dark or shadowed background, an accent light may prevent tones from merging. In portraiture, for example, a spotlight often is placed high and behind the subject, to the right or left, out of the camera's field of view. It is pointed to shine down on the subject's hair so that the contours of the hair are outlined with this bright light, clearly defining the subject. A similar method can be used when photographing a complete figure, a still-life arrangement, or a single small object.

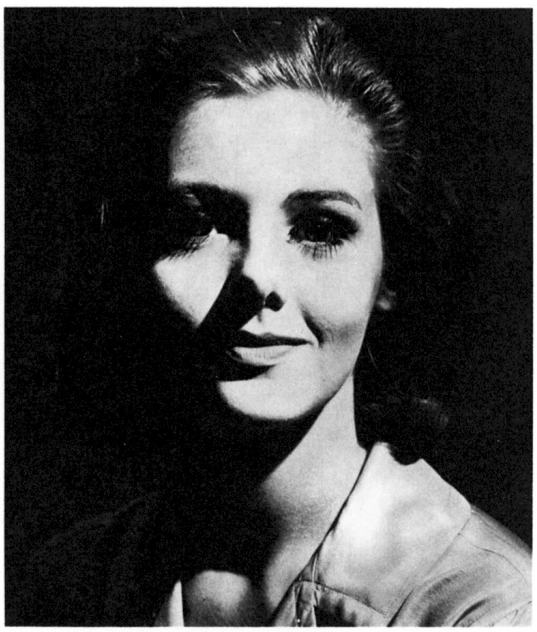
4 Add a background light: By pointing a floodlight or spotlight at the background, you can give the picture a more airy feeling, and also make any dark subject stand out more strongly. Sometimes both a background light and an accent light are used for the same picture, along with the mainlight and fill. At other times you may prefer to add only one or the other, or just to use the mainlight and fill alone.

The important thing is to follow a controlled, logical procedure. First, establish your principal lighting. Then add as much fill as you need. Finally, add accent and/or background lights as needed. Study the accompanying pictures and diagrams in which Arthur d'Arazien demonstrates this procedure.

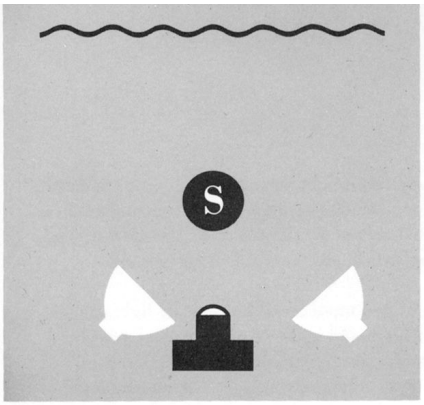
With a mainlight, fill-in light, accent light, and background light, you should be able to provide effective lighting for almost any studio pictures you take of one person or small objects. Of course, for some subjects–such as large interiors or groups of people–you may need additional lights. For example, several accent lights may be needed to separate several pieces of furniture or machinery from the background. Still, no matter how many light sources you use, essentially each light must do one of the four basic jobs we have discussed here.

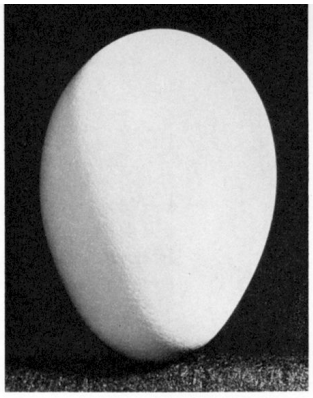


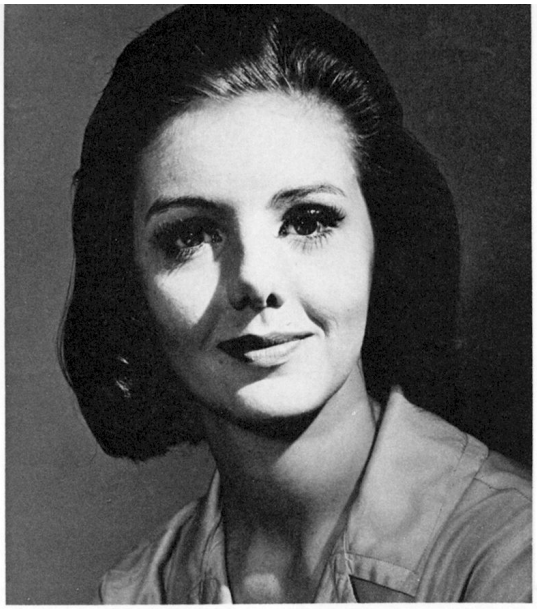




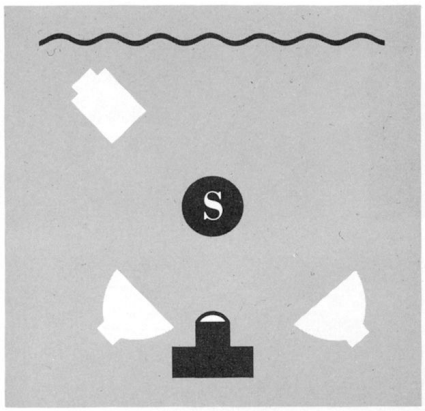
1 Place the mainlight in position: Here it is high and at a 45-degree angle. Since only a single light is used, the shadows on both the egg and the girl's face are dark, producing a harsh, contrasty effect. Naturally, the 45-degree position is only one possibility–the mainlight can be placed in any position you wish to achieve a particular effect, as we'll demonstrate a little later.

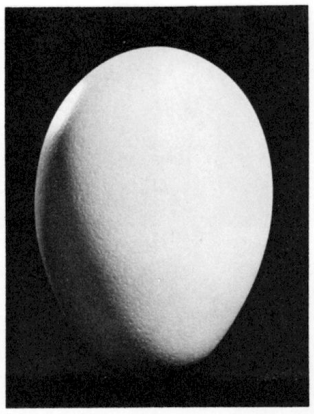




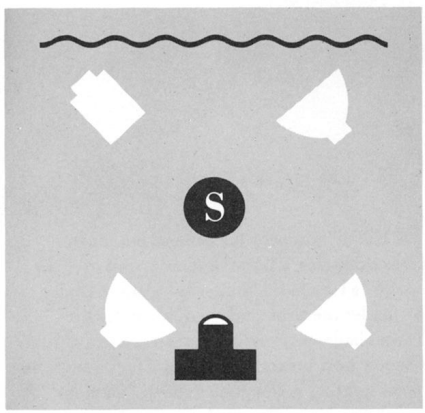


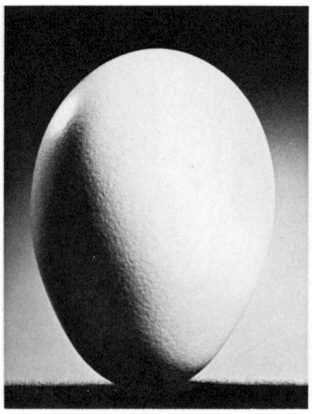
2 Add a fill-in light: The purpose of the fill-in is to add light to the shadows while maintaining the modeling produced by the mainlight. For this picture d'Arazien placed the fill-in light close to the left side of the camera [the opposite side from the mainlight]. Now we can see detail in the egg and the face where before there was only black shadow. However, the fill-in light is adjusted so that it neither wipes out the shadows created by the mainlight nor produces visible shadows of its own.

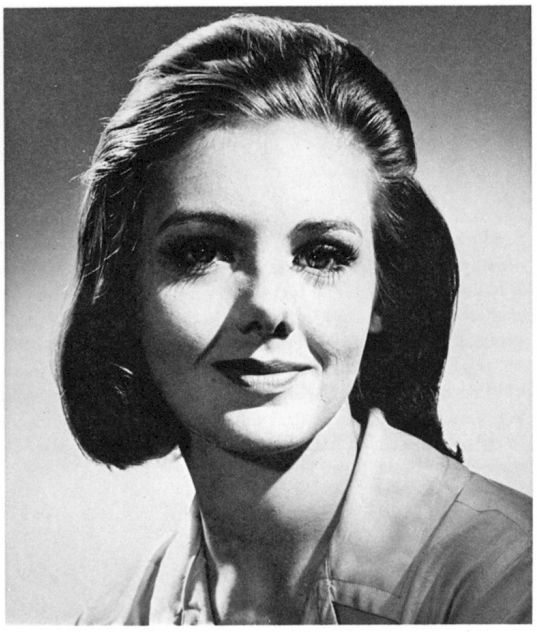




3 Add an accent light: This light is used to give sparkle to the picture and make the subject stand out more clearly from the background. Here he placed a spotlight high and to the left, pointed at the top of the subject. [See the accompanying diagram.] It puts a strong highlight accent on the egg, and creates a "rim" of light that outlines the contour of the girl's hair from top to bottom on the side facing the accent light.





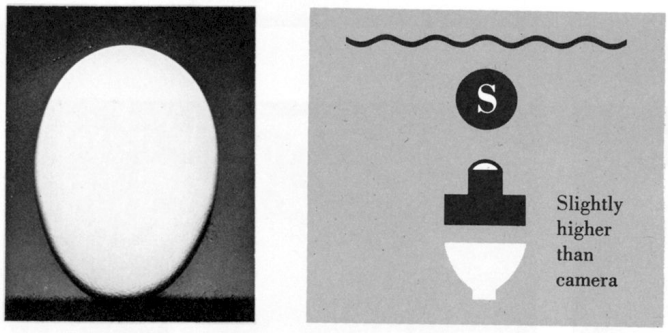


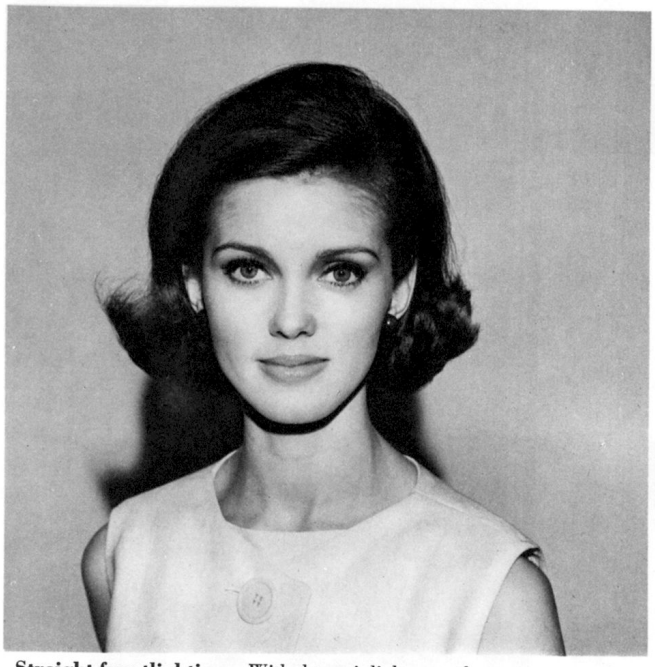
4 Add a background light: This light is pointed at the plain background behind the subject. Its purpose is to give the picture a lighter feeling and increase the separation between subject and background. The girl's entire head now stands out clearly; there is no merging of dark hair with dark background. Notice that the varied lighting of the background adds interest to both pictures.

Positioning the mainlight

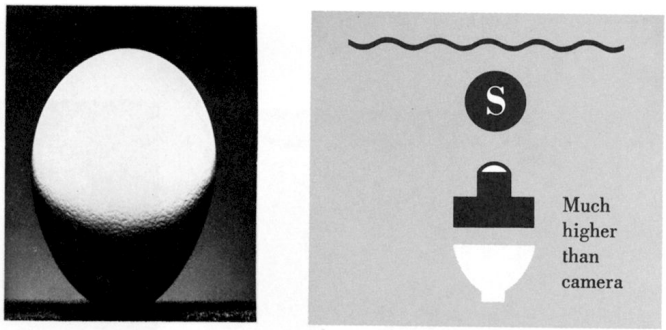
Deciding where to place your mainlight is the first and most important step in studio lighting. Mood, contrast, composition, form and texture, and the emphasis or concealment of details all can be strongly affected by the mainlight's position. So choose this position purposefully and with care.

You have an almost unlimited number of choices. The light can be placed low, at eye level, or high, and it can be positioned at any point around your subject. In studio practice, however, there are several basic positions which are most commonly used. We demonstrate six





Straight frontlighting: With the mainlight near the camera, aimed directly at the subject, you get very even illumination. Here the light is behind the camera and just slightly higher. There is very little shadow on the egg—only a narrow rim around the lower part. The girl's face is evenly lighted too, with only a very small shadow under her nose and chin. The same light illuminates the background and casts a shadow directly behind her. This even lighting is useful when you want to reveal the natural values of your subject. It also tends to show things as flat shapes rather than to emphasize their three-dimensional form.



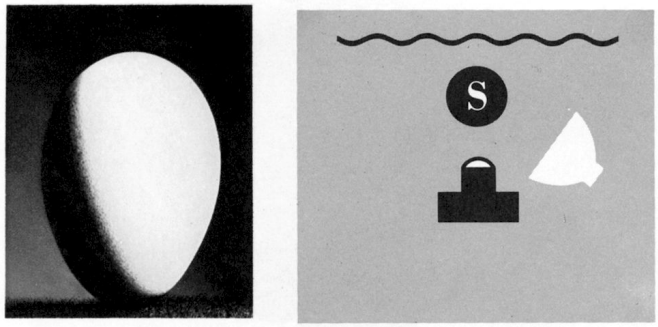
High frontlighting: With the light near the camera but much higher than in the previous examples, a large shadow is cast over the bottom of the egg. The model's face has a "butterfly" shadow under the nose, a larger shadow under the chin, and shadows under the eyebrows and cheeks. These shadows reveal the bone structure of her face. The background shadow now is cast down behind her, out of the camera's sight. This type of lighting is sometimes called "glamour" lighting. It's often a good choice for portraits of young women because it models the structure of the face in a flattering way.

of these basic mainlight positions here and on the following page, again using a very simple form–an egg–and a more complex form–a girl's face. Study the effects of these basic lighting positions, and look at the accompanying diagrams to see the position of the subject, camera, and floodlight.

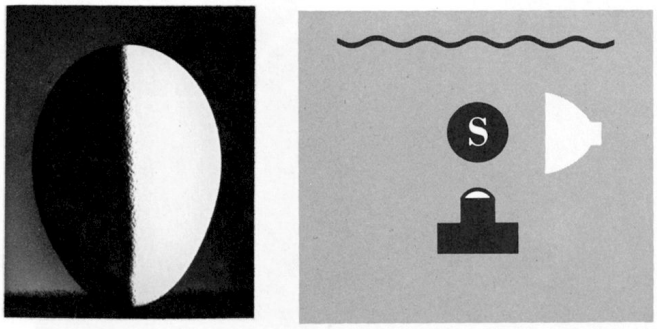
Many of the lighting effects you see here duplicate the outdoor lighting effects you studied in the previous lesson. In fact, the most pleasing studio lighting is simple and uncontrived, reminding us of the lighting we are accustomed to see in nature.

For example, we are accustomed to see things by light from the sun –light that falls from overhead. Therefore, for natural-looking lighting, keep the mainlight *higher* than the subject.

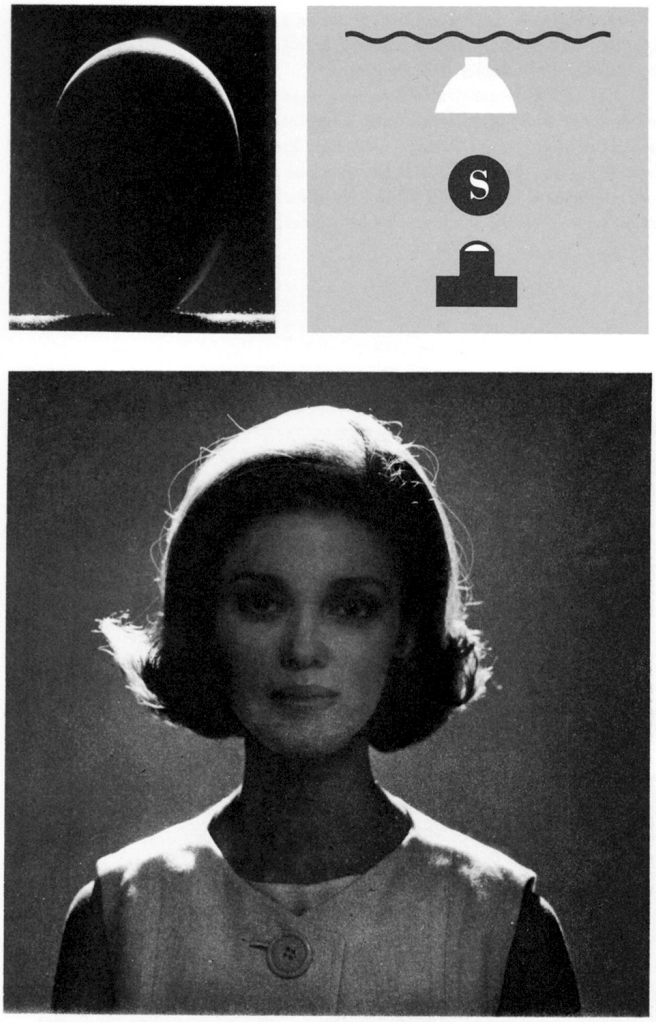
To make these demonstrations as clear as possible, we purposely used only one floodlight in each case. Therefore, the shadows in these pictures are generally dark, creating a harsh, contrasty effect. To lighten them, a fill-in light should be added. However, as we emphasized before, this fill-in light should not be so strong that it "wipes out" the shadows cast by the mainlight.



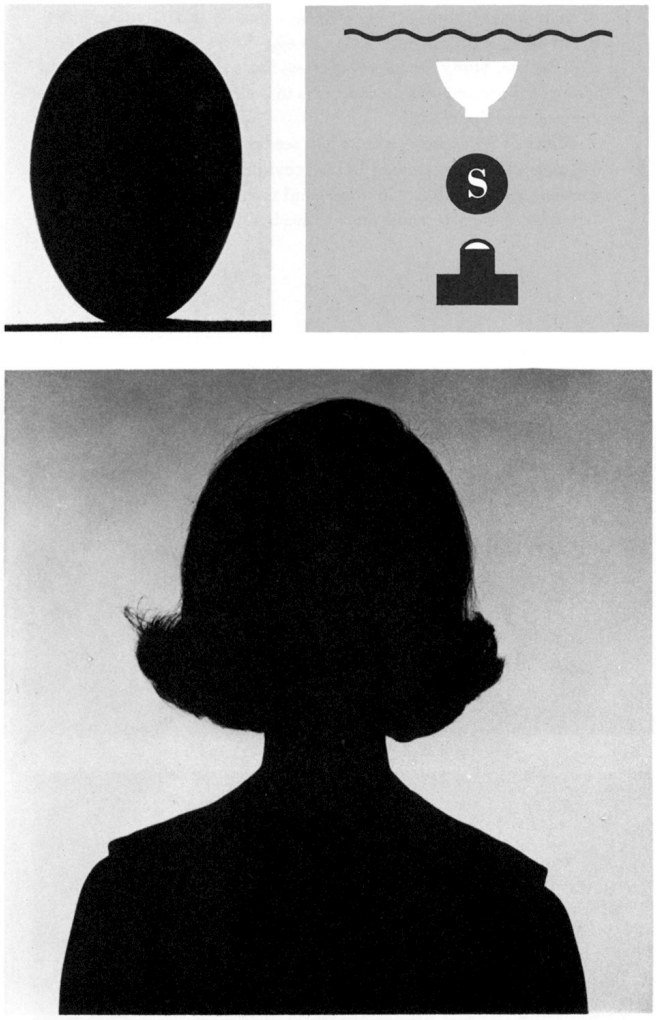
45-degree sidelighting: This lighting produces a shadow which falls on the egg at an angle. On the girl, it creates a characteristic triangular highlight on the cheek away from the light. In this case, the floodlight was somewhat higher than the camera, and to the right of it. Of course, 45-degree sidelighting also can come from the left. This type of lighting long has been a standard for portraits. It seems to flatter most faces, and the shadows model the nose, lips, cheeks, and chin, emphasizing the solid form of the features. With nonportrait subjects, too, it is useful when you want to show the form of something by the interplay of lights and shadows. It is a simple, natural kind of lighting that does not draw undue attention to itself.



90-degree sidelighting: This is sometimes called "hatchet" lighting because it divides the subject in half. Where the light skims the surface of skin, cloth, or other material it emphasizes texture. [Compare the girl's blouse here with the way it looks in the frontlighted examples.] This contrasty, texture-revealing lighting can be effective when you want to emphasize the rugged masculine quality of a man's face, to suggest the feel of a fabric, or to dramatize a subject with strong contrast between highlights and shadows. The harshness of sidelighting often is softened by the use of fill-in light.



Rimlighting: Light shining on the subject from behind produces rimlighting. For these examples, we placed the mainlight high and directly in back of the subject, out of the camera's field of view. The light falling from above and behind creates a narrow crescent of light along the top of the egg. On the girl, the rimlighting shines through her hair and outlines her head and shoulders. Rimlighting can be used for special dramatic effects when you want to emphasize the contours of a figure or the shape of an object.



Silhouette lighting: When the light is thrown on the background only, so that none of it reaches the subject, you get a silhouette. Both the egg and the girl are completely in silhouette in these examples; you see only the shapes–the details are left to your imagination. Of course, exposure plays a part in achieving a full silhouette. If your exposure favors the bright background, the shadows will go very dark, as they did here. However, if you give a more generous exposure, you can capture some shadow detail. Silhouettes are effective only when the subject's outline is interesting and meaningful–a person's profile, for example, or an easily recognized object.

Practice with lighting

The examples we have been looking at show only a small fraction of the total effects possible even with one light source. We suggest that you take an object, place it on a table, and then experiment with the enormous variety of lighting effects you can get with a single photoflood.

Place the light in different locations and study the effect of each from camera position. Which positions reveal solid form and texture best? Which flatten out the subject? What positions create the most pleasing arrangements of highlights and shadows? Which lighting would you choose if you wanted to record the object for a catalogue? An advertisement? To dramatize it?

In these experiments, you don't actually need to take a picture each time you try a new lighting position. But really use your eyes for intensive, detailed observation. Be aware of the compositional aspects of the lighting, too. Watch for lines of direction created by the shapes of shadows and their edges. Notice how the values and their relationships change as you alter the position of the mainlight.

This kind of practice, with different objects and with people, is one of the best ways to develop a "lighting sense" that will be very helpful in all the indoor pictures you make.

Exposure for floods and spots

With indoor photography, just as with your outdoor shooting, the careful use of an accurate exposure meter will assure you of consistently good negatives. We suggest that you review the basic ways to use exposure meters demonstrated in the lesson on black-and-white photography.

Photoflood exposure tables are included on film data sheets, and there are photoflood exposure guides available. The guides have a rotating dial and can be used to determine approximately correct exposure for different bulb-to-subject distances. However, an exposure meter provides by far the most precise and reliable way to control exposure indoors, and we strongly urge you to get one and use it, if you are not already doing so.

In a multiple-light setup, the mainlight and the fill-in light determine the basic exposure. Background and accent lights usually don't affect the overall exposure. In fact, we recommend that you *leave these lights turned off* when you make your exposure readings. This will eliminate the danger that these lights may shine directly into your meter cell and give you a misleading reading. After you've made your reading for the mainlight and the fill-in light, you can turn on the background light and take a close-up reading of the background itself if you wish. [You might want to do this to adjust the brightness of the background so that it doesn't record too dark or too light.]

Indoors as well as out, take readings *close to the subject.* An overall reading made from camera position is likely to be very misleading. Therefore, follow these guides:

Incident-light meter: Hold it close to the subject and point the light collecting cell toward the camera, with both your mainlight and fill-in light turned on.

Reflected-light meter: Take close-up readings from portions of the subject facing the camera, with both mainlight and fill-in light turned on. Take a highlight reading and a shadow reading, and use an appropriate compromise exposure if necessary.

For small or hard-to-read objects, take a substitute reflected-light reading from a standard gray card held close to the object and facing the camera.

When photographing people, remember that skin tones generally reflect a considerable amount of light. If you make a close-up reflected-light reading from a person's face or your own hand, increase the indicated exposure by 1/2 to 1 stop or even more, depending on the amount of shadow detail you want.

Color photography with floods and spots

Everything we've discussed so far applies to color shooting as well as black and white. Of course, when shooting color indoors, you should be especially careful to achieve accurate exposure. And generally you should avoid strong lighting contrast. With a studio, it is very easy to create exactly the amount of lighting contrast you want by adjusting the relationship of fill-in to mainlight. On the following page we give you a detailed, simple procedure for doing this.

Type A color-transparency films are balanced for use with any photoflood bulb [standard or built-in reflector type] without the use of filters. However, for the most accurate color, your photoflood bulbs must be relatively fresh. As they are used, the quality of light they produce tends to become warmer. Use fresh bulbs for your color shooting. Keep a record of the amount of time the bulb has burned. When *half* the rated life of the bulb has elapsed, replace it with a fresh bulb. Of course, you can continue to use the old bulb for black-and-white shooting as long as it continues to burn.

Type B color-transparency films [also classified as *tungsten-type films*] are balanced for use with professional studio floods and spots. These are rated at 3200K, which is slightly warmer than 3400K photofloods.

However, with the appropriate warming or cooling filter, Type A film can be used with 3200K studio lights, and Type B film can be used with photofloods. See the color filter section of your Technical Manual for specific filters for different makes of color film.

With color-negative film, you should follow the manufacturer's recommendations regarding filters for use with 3200K or 3400K floods.

This is a good time for you to review some of the basic facts about color you studied in the color lesson—especially the section on using different kinds of color schemes. It is under the controlled conditions of studio photography with floods and spots that you often have your best opportunity to put this knowledge to work in creating exciting color pictures.

Bounce flood

Bouncelighting with floods is such a simple, effective, and versatile type of illumination that it deserves special attention. It can be used in a studio when you want a soft, diffused quality of illumination. But it also can be very helpful when you are shooting "on location" and need to add more light to a small or medium-sized room, or an area of a large room.

For example, let's assume you want to cover a party in a living room, or a board of directors' meeting in an office. You want to raise the brightness of the lighting in the room so that you can shoot with a comfortable combination of fast shutter speed and small aperture. Yet you don't want to set up a complicated arrangement of lights that will get in people's way.

A good solution would be to place two, three, or four small reflector photofloods on light-stands at various points in the room and reflect their illumination from the walls or ceiling. One light in each corner should do the trick very well.

When you turn the lights on, they will suffuse the room with fairly intense but soft illumination. The effects of glare and heat are minimized because the photofloods are pointed toward the walls or ceiling, not the subjects. The low-contrast, nearly shadowless illumination makes it possible for you to take pleasingly lighted pictures from almost any camera position. Thus both you and your subjects have great freedom to move around.

You can make the lighting more or less directional by regulating the distance from the lamp to the reflecting surface. The farther away the photoflood, the softer and more diffused the light. Experiment with your equipment beforehand to find the quality of light that best suits your purposes. In general, it's a wise idea to keep the illumination quite soft, thus avoiding unpleasant shadows under people's eyes.

Instead of reflecting the light off the ceiling, you can achieve even more "scattering" by pointing the photoflood at the corner intersection of two walls and a ceiling.

Bounce floodlighting can be used with color. However, be sure the reflecting surface is a neutral white. Otherwise the subject will pick up the color of the reflecting surface.

Lighting contrast: why and how to control it

Lighting contrast is an important aspect of indoor lighting. It is the ratio between the brightest light falling on your subject and the least bright light falling on it. If the difference between the two lights is too great, your film and printing paper may not be able to record details both in the brightest highlights and the darkest shadows. Lighting contrast can also produce an emotional effect. High-contrast lighting is strong, dramatic, sometimes even harsh; low-contrast lighting creates a gentler, more pleasant effect. Therefore, both for technical and aesthetic reasons, the control of lighting contrast deserves your serious attention.

When you use floods and spots in a studio, you have almost complete control over lighting contrast. The most practical way to achieve the effect you want is to adjust the brightness of your fill-in light in relation to the mainlight. *The weaker the fill, the higher the contrast, and vice versa.*

The brightness of a fill-in light can be regulated in several ways. For example, you can place a diffusion screen in front of your bulb, or you can use a weaker bulb. But often the simplest and most effective method is to move the fill-in light. If the shadows are too harsh, move it closer to the subject. If the shadows are too light, move it further away.

The brightness of the light falls off in proportion to the square of the distance it travels. Therefore, even a small change in light-to-subject distance can have considerable effect. For example, suppose you have a fill-in light five feet away from your subject. If you move it another five feet away you double the distance but reduce the brightness of the light falling on the subject to only *one fourth* what it was.

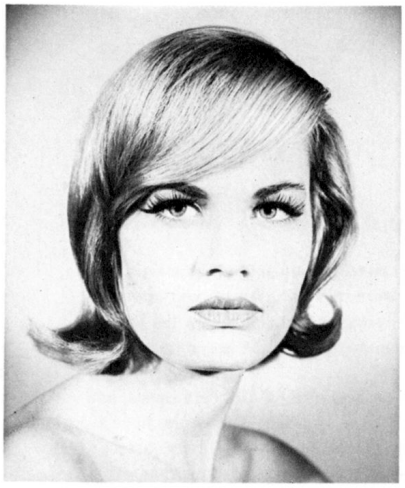
With practice and experience you can learn to judge lighting contrast pretty accurately by your eye alone. But for more precise control you should use an exposure meter. It can help you establish an exact lighting ratio–the relative brightness of your mainlight and fill-in light at subject position. Here's how to proceed, using either an incident-light or a reflected-light meter.

If you're working with an incident-light meter, turn on the mainlight and the fill-in light and hold the meter close to the subject. Turn the meter's cell to the position where it gives you the greatest reading. Now turn off the mainlight. Point the meter toward the camera and take a reading for the fill-in light only.

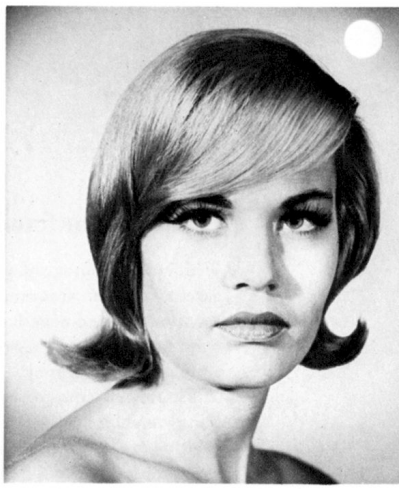
With a reflected-light meter you take your reading off a standard gray card. You can use either the gray side or the white back. In normally bright lighting the gray side will probably be suitable. But if the lighting is rather dim you may be able to get a more accurate reading by using the white back, which reflects more of the light. After turning on the mainlight and fill-in light, hold the card in front of the subject, facing the camera. Take a close-up reading from the card, turning it until you find the position that gives you the largest reading. Then put out the mainlight. Again hold the test card so it faces the camera and take a close-up reading for the fill-in light alone.

In each case, the two readings will indicate the lighting ratio. For example, if the mainlight-plus-fill reading is four times brighter than the fill-in reading, the ratio is 4 to 1 [sometimes written 4:1].

A lighting ratio of about 3 or 4 to 1 often is used in portraiture, product photography, and catalogue illustration. For color work many studio photographers commonly employ a ratio of 2 or 3 to 1. However, much higher ratios can be used, too, depending on the effect you want. [For examples of various lighting ratios, see the portraits at right.] The best lighting ratio for any picture is the one which best serves the needs of the picture.

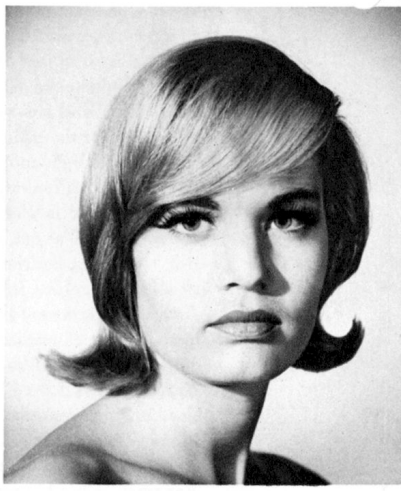


A 1-to-1 lighting ratio gives flat, even lighting with hardly any shadows.



A 2-to-1 lighting ratio gives very low contrast.

A 4-to-1 lighting ratio is commonly used in black-and-white portraiture.

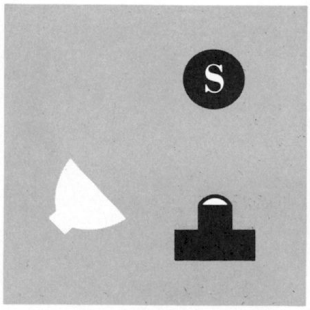


An 8-to-1 lighting ratio is contrasty, with dark shadows.

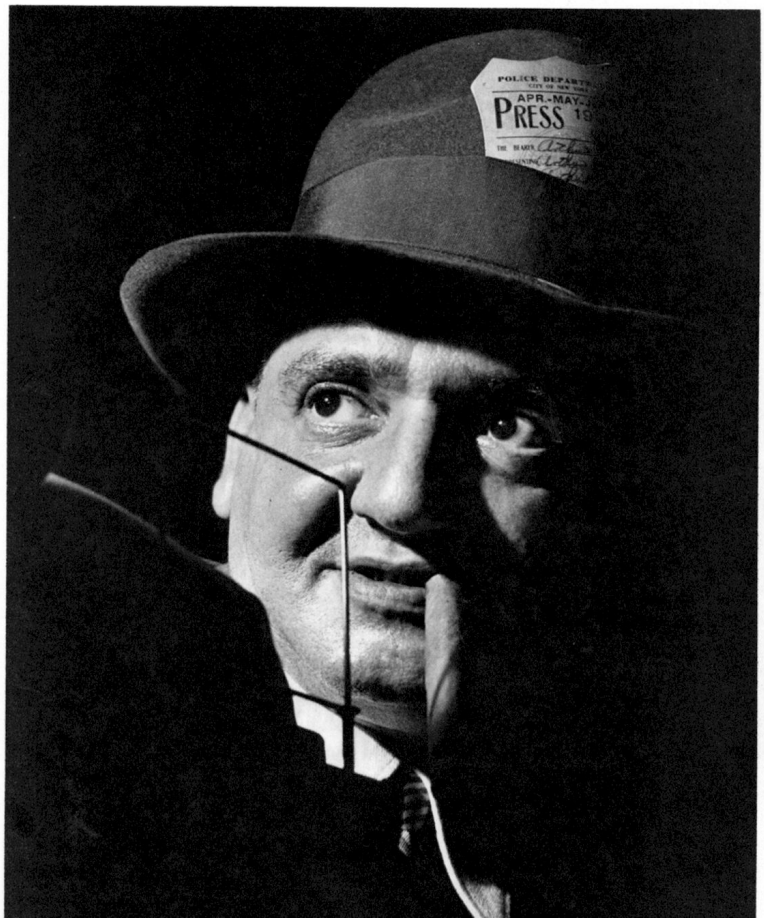
A 10-to-1 lighting ratio gives high contrast and creates a dramatic mood.

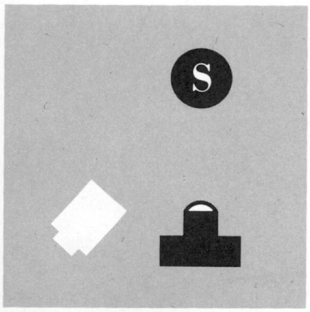
How your Faculty uses floods and spots

On this and the following pages you see photographs made by members of your Guiding Faculty, using floods and spots. Carefully study these pictures and the lighting diagrams that accompany them. You can learn much from them about the many different effects you can achieve with these lighting units.



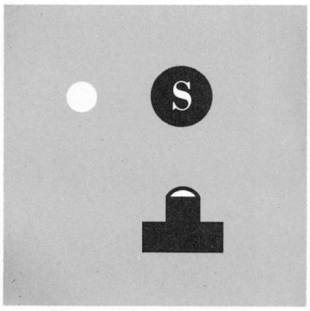
A striking example of a single-light portrait is this Philippe Halsman picture of actress Mai Zetterling. Here Halsman used a floodlight as his only source of illumination. The dark shadows it throws on the sides of the face and under the eyebrows, nose, and lips emphasize the haunting, intense beauty of the actress. Compare this to the Halsman portrait of Weegee below and note the difference in the quality of light thrown by a single spot and a single flood. The floodlight creates softer shadows and less brilliant highlights, more suited to the face of a beautiful girl than the harsher illumination of the spotlight.



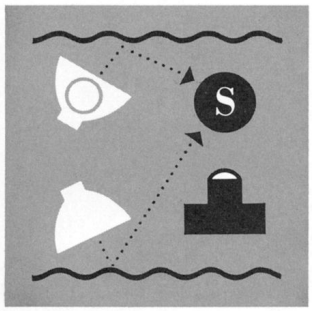


Halsman chose the harsh, contrasty illumination of a single spotlight for this dramatic portrait of a fellow photographer, Weegee. The light emphasizes the shape of the face and creates deep shadows which suggest the darkness of night–the time when Weegee, the photographic reporter, has taken some of his best pictures. Note that even though the press camera Weegee carries is almost completely in shadow, its presence is made known by the portion of the wire framefinder in front of his face.

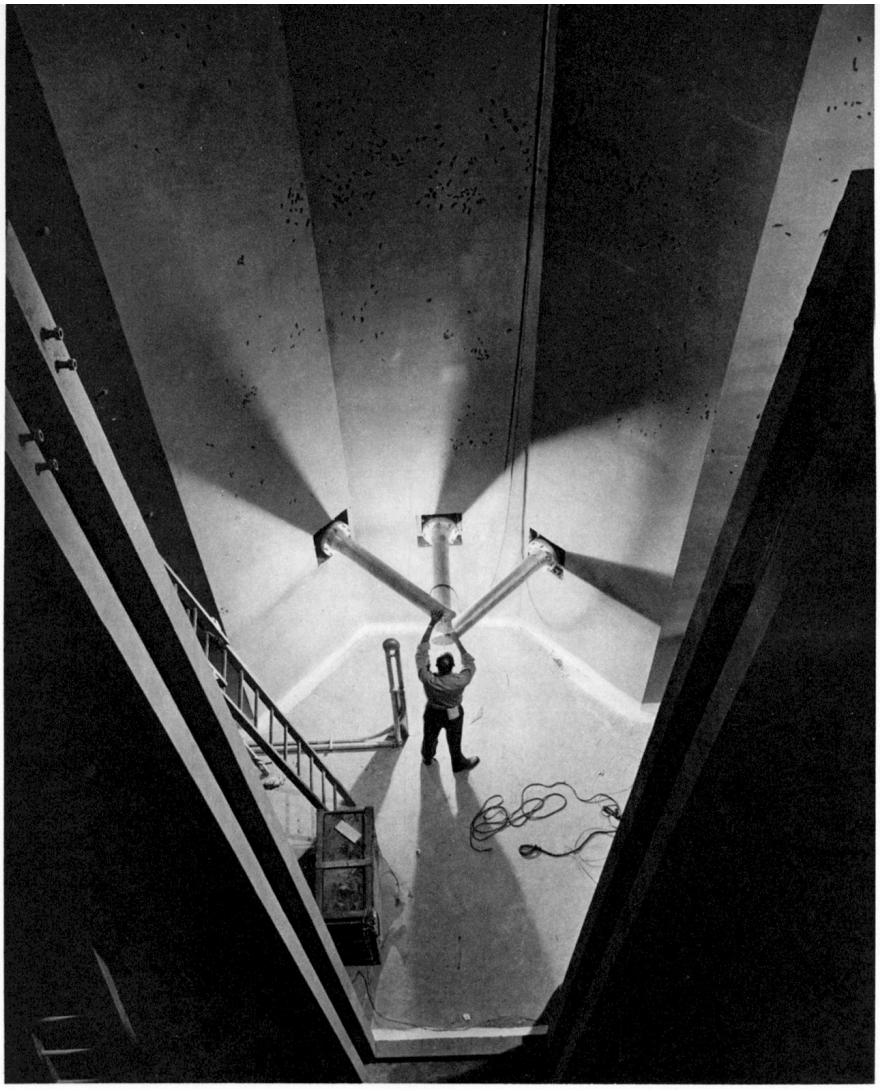
Faculty: floods and spots [*continued*]

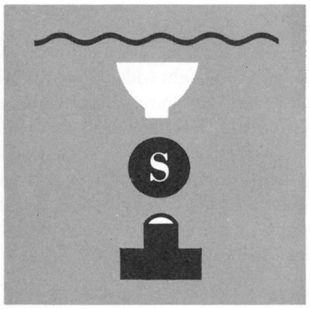


Bert Stern made this photograph of British comedian Peter Sellers for *Vogue*. The only light was the bare bulb seen in the picture, which illuminated the seamless paper background evenly and at the same time threw strong, contour-revealing shadows on the comedian's face, showing us one of his typical expressions. Except for his face and arm, Seller's body is in semisilhouette, which emphasizes his whimsical pose. This is distinctly offbeat lighting, used to suggest an offbeat personality.
[Courtesy *Vogue*, ©1962, Condé Nast Publications, Inc.]

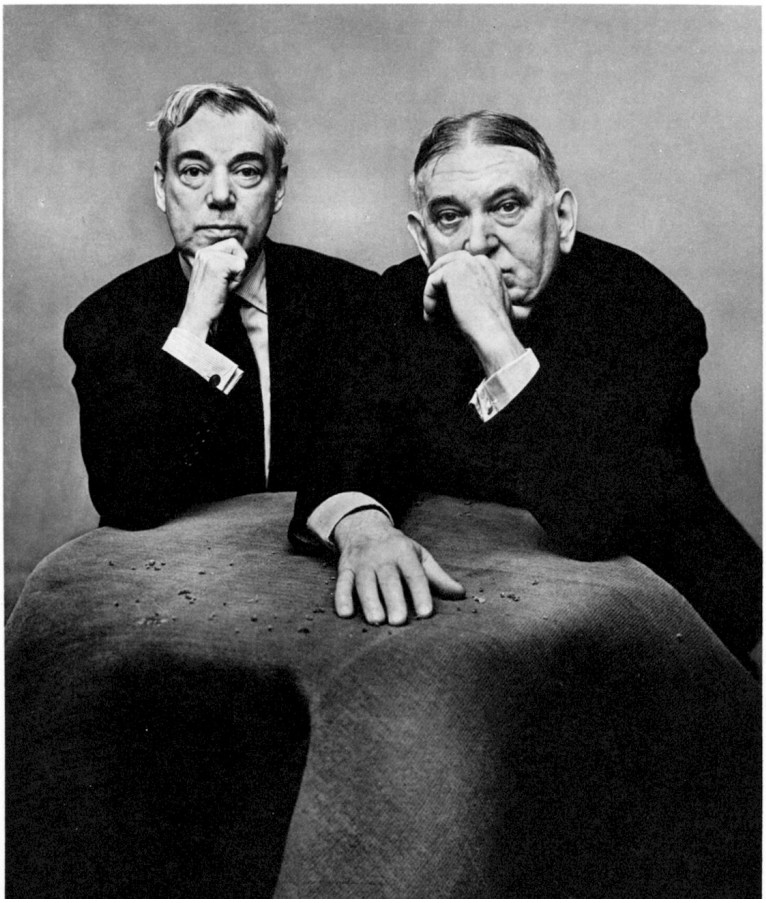


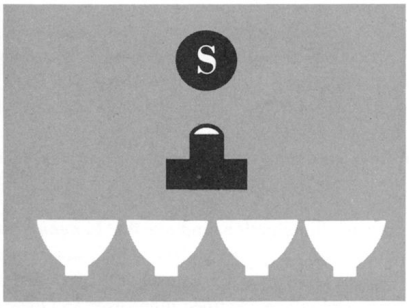
Arthur d'Arazien used bouncelight to make this picture of research scientists at the Olin Mathieson Company of New Brunswick, New Jersey. Using two 1,000-watt floodlights, he reflected one off the ceiling near its juncture with the wall behind the scientists. He reflected the other off the wall in front of them and somewhat to the left, thus filling in the shadows. You can see that even though bouncelight is relatively diffuse, it does throw soft shadows which model the subjects. It also suggests normal room lighting–an effect that d'Arazien wanted as he showed his subjects in a candid and relaxed situation.
[Courtesy Olin Mathieson Chemical Corp.]





Ezra Stoller used a single 500-watt floodlight beyond the subject and aimed at the far wall for illumination in this high-angle industrial photograph. The shadows of the man and of the pipes on which he is working repeat the converging V-shaped lines of the room and lead the viewer's eye directly to the center of interest. The stark contrast of lights and darks created by this type of illumination adds greatly to the strength of the composition. The backlighting also gives a feeling of space to the picture, and clearly separates the man from the background.
[Courtesy Curtiss-Wright]





In making this fascinating double portrait of critics George Jean Nathan and H. L. Mencken, Irving Penn placed a bank of four floodlights in a high front position. This produced diffused but directional lighting. It is quite soft and yet creates excellent modeling on the men's faces. Penn exposed for good detail in the faces, letting the dark suits go black. Their simple shapes join the two men together and help unify the composition. The advantage of using a bank of floods–with their individual lights overlapping to create a broad, diffused source–is that it simulates the hazy light of an overcast day and gives things a natural look.
[Courtesy *Vogue*, ©1948, Condé Nast Publications, Inc.]

Flash

A second kind of artificial light widely used for indoor photography is *flash*. Equipment for flash illumination comes in two basic types: *conventional flash* [using flashbulbs] and *electronic flash*. The light from a flashbulb or electronic-flash unit can produce effects similar to those you can get with studio lights. There is, however, one very important difference. Unlike floods or spots, the flash unit gives illumination for only a fraction of a second. The picture is taken by this brief but intense blast of light.

How flashbulbs work

A flashbulb is an airtight bulb containing a combustible material. When electric current is passed through a fine wire filament, the wire glows white hot. This ignites a "primer" powder coated on the tips of the wires supporting the filament. The burning primer, in turn, fires the combustible material. This material may be crumpled metal foil or wire, or a combustible gas. The foil or wire-filled bulbs are charged with oxygen to promote fast, complete burning. Of course, once you've fired a flashbulb, it is burned out and must be discarded.

A flashbulb produces its flash very rapidly. To the human eye, this seems almost instantaneous–a quick "blink" of light. But if you were able to observe it in slow motion, you would see that what actually takes place is similar to the burning of a bonfire. It takes a while for the fire to get started and reach its maximum intensity [known as its *peak*]. It burns at full strength for a time, and then gradually dies down.

Obviously, it is important that the flash should reach its maximum brightness at the same time the shutter of your camera is open. If the bulb "peaks" too soon, or too late, the maximum brightness of the flash will not be utilized. Therefore, most modern cameras are equipped with built-in *flash synchronization*–an internal mechanism that automatically insures that the bulb fires "in step" with the shutter when you trip the shutter release. [Some flash units also permit you to fire the flash directly by a trigger or button on the unit. This is useful when you want to shoot *open flash* pictures, as described later in this lesson.]

For details on several different types of flashbulbs and on flash synchronization, see your Technical Manual.

The equipment used with flashbulbs includes a reflector, which directs the light much in the same manner that a reflector for a floodlight does. Also needed is a source of electric current to fire the bulb. This may come directly from a *battery* or from a *battery-capacitor* [often called a B-C] power supply. In a B-C unit, the batteries are used to charge a capacitor [also called a condenser] with a supply of current. When you fire the flashbulb, you draw current off the capacitor. A B-C unit produces a stronger, more dependable surge of current to fire your bulbs, and can extend the usable life of your batteries. Therefore, if you are acquiring a flash unit, we strongly recommend that you choose a B-C model.

Electronic flash

The second type of flash illumination, and one that has come into increasing popularity in recent years, is electronic flash [also known as "speedlight"]. Among its special advantages is the fact that it uses the same "bulb"–actually a gas-filled tube–over and over again. A typical electronic-flash unit may provide you with upwards of 10,000 flashes before it needs to be replaced.

Each flash is of extremely brief duration–about 1/500 to 1/2,000 second for portable units and considerably faster for the more powerful studio units. An electronic-flash unit requires one or more condensers charged to a relatively high voltage. In portable units, wet or dry batteries plus other electrical components are used to furnish the charge. These components are called the *power pack*. In the case of some small units and most studio equipment, a regular alternating household current can be used instead of batteries. This is stepped up to a high voltage by a transformer and then converted into direct current before being applied to the condensers.

After each flash, both with battery-operated and AC models, a certain time is required before the charge in the condensers builds up to the required level again. This *recharging* or *recycling* time may be anywhere from a few seconds to a minute or more, depending on the unit, the power supply, the age and condition of the batteries, and other factors.

How flash units are used

Basically, there are three methods of using flash units, either conventional or electronic.

1 On the camera: Here the flashgun and its reflector are attached directly to the camera, usually with a bracket arm. In the case of portable electronic flash, a separate power pack may be carried by a strap over the photographer's shoulder, with an extension cord connecting the pack to the camera-mounted flashgun.

This is the simplest method of using flash, and the one most beginners first try. However, it limits you to flat frontlighting, unless the reflector head tilts or swivels to let you bounce the light.

2 Off the camera, but attached with an extension cord: A flash unit used in this way may be held in your hand and moved around for more varied, interesting lighting effects. Or, if the cord is long enough, the flash may be mounted on a light-stand or other support at a considerable distance from the camera. The extension cord connecting the flashgun and the camera is needed to insure that the flashbulb fires in step with the shutter. Depending on your equipment, more than one extension flash may be used at the same time, or you can use a combination of flash on the camera and one or more extension flashes.

3 Off the camera, slave unit: A *slave unit* is a self-contained flashgun with a light-sensitive cell that fires the flash in response to another flash. Thus you can have a flash unit mounted on your camera plus one or more slave units placed around a room. When you fire the flash on your camera, the slave units will fire too–without the need for extension cords. Slave units are particularly convenient for more complex lighting setups.

Because either type of flash illumination–bulb or electronic–is visible only for an instant, it is much more difficult, particularly for a beginner, to visualize what the lighting effect will look like in the picture. While photofloods can be moved about until you see exactly the effect you want, the split-second burst of light produced by a flash unit is over so rapidly that you must wait until you develop the film to see precisely what effect you got. However, with practice and experience–plus the valuable knowledge you gain by using floods and spots–you can also acquire a high degree of control over flash.

Some types of studio electronic-flash units include "modeling" lights. These are electric light bulbs you can turn on while positioning the flash units to see the effect you'll get when you take the picture.

Why flash?

Even though the lighting effects created by flash often are not so different from the effects you can get with floods or spots, there are many indoor shooting situations where flash gives you strong advantages. Briefly, the most important advantages are these:

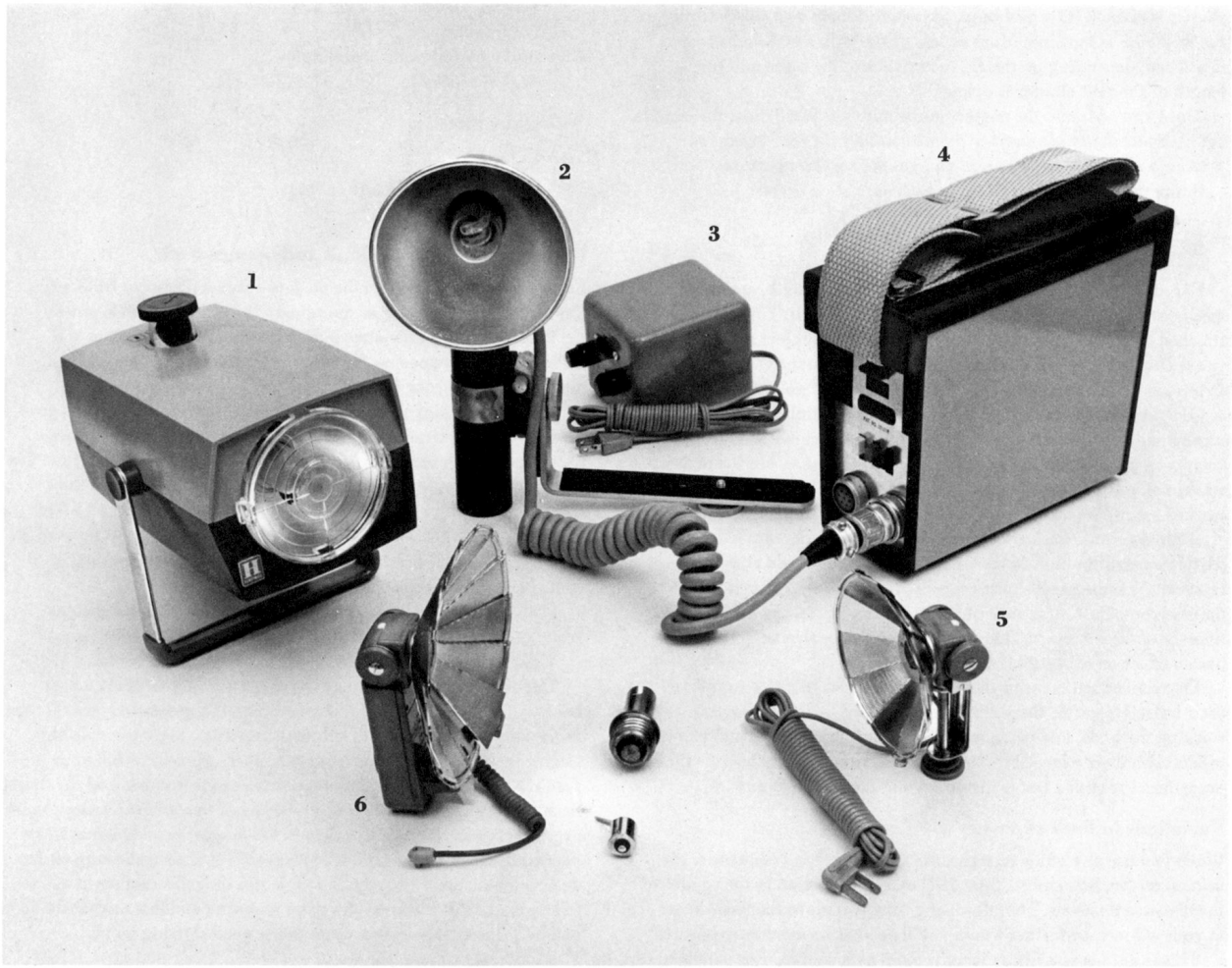
1 Portability and convenience: Many flash units–both conventional and electronic–are small, lightweight, and easy to carry. These portable units work from battery current, so you can use an artificial light source in places where there is no current for floods or spots. For this reason portable flash is widely employed by press photographers, photojournalists, industrial photographers, and others who work on location. [There are large studio flash units, too. Although not highly portable, they offer the advantages described below.]

2 Intense light: Even a very small flashbulb [in a correctly designed reflector] can produce more light than a 500-watt spotlight.

This intense light often allows you to shoot with a small aperture for greater depth of field or to use a high shutter speed to stop action. To illuminate large groups or interiors, flash often is a more practical choice than flood. Electronic flash has the advantage of an extremely brief flash that can freeze subject motion and reduce the danger of blur due to camera movement. However, on a per-pound basis, it usually gives less light than conventional flash.

3 Coolness: When you shoot with flash, the subjects are not disturbed by heat and glare as they may be when floods or spots are used. Many subjects [such as flowers, perishable foods, animals, and babies] are difficult if not impossible to photograph under hot floodlighting conditions, but can easily be recorded with flash. This advantage makes flash an obvious choice for many indoor shooting situations.

Flash is a convenient, safe, and versatile source of artificial light for photography. On the following pages we'll demonstrate some of the basic methods of flash shooting. We'll concentrate on the simplest, most useful ways to take flash pictures around your own home, school, or office. At this stage in your Course, we certainly don't expect you to master all the refinements of flash. But we do want you to begin to familiarize yourself with its tools and methods in preparation for more advanced work. We want you to get the "feel" of flash. And the only way to do this is to acquire a flash unit and try for yourself the techniques explained on the following pages.



Typical flash units

Here are some of the many types of units for both conventional and electronic flash:

1 An electronic-flash slave unit, which fires automatically when the main flash goes off, thus supplying a supplementary light without any connecting wires. One or more of these units may be used with the main flash unit.

2 A portable electronic-flash unit [attached to its power pack]. It may be used whenever light is needed.

3 An AC power pack, which allows the flash to be used with regular house current instead of the battery power pack. This is good for studio use.

4 A power pack for a portable electronic-flash unit.

5 An extension flashgun of the folding-fan type, which can be folded so that it takes up less room in packing. It can be clamped in place some distance from the camera and attached by its long cord to the main flashgun so that it will fire at the same time.

6 A folding-type flashgun, which collapses into a minimum of space, convenient when you are traveling light.

Flash exposure

When you shoot flash, it isn't possible to take a reading with a conventional exposure meter, as it is when you shoot in sunlight or by floods or spots. Instead, the most effective way to calculate flash exposure is by using guide numbers. [Special electronic-flash exposure meters are available for studio work. Although relatively expensive, they are very helpful and we will discuss them in more advanced lessons.]

Flashbulb manufacturers usually include tables of guide numbers on the flashbulb carton. You'll also find a listing of guide numbers for some of the more popular types of bulbs in your Technical Manual. Although these tables may look forbidding at first glance, they are quite easy to use.

The first step is to find the table of guide numbers for the particular flashbulb and film you are using. Next, choose the shutter speed you want for taking the picture. Finally, locate the guide number for your combination of film, flashbulb, and shutter speed.

If you remember what we said about flash duration, you can understand why different guide numbers may be given for different shutter speeds. With a flashbulb, the shutter opens and closes while the flashbulb is burning. More or less of the bulb's total light output is utilized, depending on the characteristics of the bulb, and the length of time the shutter is open.

Once you've found the correct guide number, just follow this simple rule: *Divide the guide number by the distance [in feet] from your flashbulb to the subject and you will get the correct aperture.*

Put in more mathematical form, the calculation is this:

$$\frac{\text{guide number}}{\text{flashbulb-to-subject distance}} = f \text{ stop}$$

For example, suppose you are using a film, flashbulb, and shutter-speed combination which has a guide number of 110. Your flash is attached to your camera, and you are shooting a subject that is 10 feet away. Dividing the guide number [110] by the distance [10] gives you an answer of 11. Set your lens aperture at *f*/11 for correct exposure.

Of course, sometimes your answer may be a number that doesn't correspond exactly to any marked *f* stop on your camera. Then use an appropriate setting in between the marked stops or use the nearest marked stop. For *f*/14, for example, you could safely use the marked setting of *f*/16.

With electronic flash the procedure is a little different. With any particular combination of flash unit and film, the guide number remains the same at all shutter speeds. The reason for this is that the electronic flash fires very quickly–on and off *during the time the shutter is open*. Therefore, changing the shutter speed has no effect on exposure.

Electronic-flash manufacturers provide tables of guide numbers for their units. However, there are so many variables in equipment, working methods, and personal taste, that professionals usually prefer to establish their own electronic-flash guide numbers by test. A simple procedure for such a test is given in your Technical Manual.

Variations in flash exposure

When you use any guide number, *the flash-to-subject distance is the critical factor*. Remember, light falls off in proportion to the square of the distance it travels. Therefore, any time you move the flash closer to your subject, or farther away, you'll need to recalculate exposure.

This is not necessarily as inconvenient as it sounds. For example, with a flash unit attached to a rangefinder or reflex camera, you can focus on your principal subject and then look at the focusing scale to quickly determine the flash-to-subject distance.

If you know beforehand the circumstances under which you'll be shooting you can use a further shortcut. For example, you can choose your film, flashbulb, and shutter-speed combination and locate the guide number. Then calculate the *f* stops for correct exposure at several distances you expect you'll be using–say a close-up distance [4 to 5 feet], a medium distance [8 to 10 feet], and a relatively long distance [say 15 feet]. Jot these distances and corresponding *f* stops down on a small card or piece of paper and attach it to your flashgun for instant reference.

Guide numbers, as the name implies, are *guides only*. They are *approximate*, for normal subjects in rooms of average size and shape, and you will need to adjust exposure to compensate for many variables. The size, design, and material of your flash reflector affect the usable amount of light you get from the bulb. The size of the room, the lightness or darkness of the walls, and the values in the subject itself also are important. So are your developing and printing methods and your personal taste in the type of negative you prefer. The necessary compensations must be worked out with *your* equipment, by *you*, in *your own shooting*.

If you consistently get negatives that are too dense, try increasing the guide number by about 25 percent. If your negatives are consistently too thin, try reducing the guide number about the same percent. Again, *standardizing* on one film-and-flashbulb combination until you know its characteristics thoroughly will pay off in quicker mastery of technique.

In general, *increase* exposure for:

large rooms
dark-colored walls or ceilings
dark subjects

Decrease exposure for:

small rooms
light-colored walls and ceilings
light subjects

Exposure for multiple flash and bounce flash

Flash exposure is based on the *flash*-to-subject distance. Obviously, this may not be the same as the *camera*-to-subject distance unless the flash unit is actually attached to the camera. When using a flash unit on an extension, be sure to calculate the distance from the flash itself to your subject.

With setups using more than one flash [often called *multiple flash*] the number and arrangement of your lighting units will determine exposure. If each unit is to light only one part of the subject, then use the normal guide number and the distance from that unit to the subject. This might be the case in a large interior where you place several flash units around the room to illuminate different parts of it.

Where the light from two or more flash units overlaps the same part of the subject, try the following:

With two flash units of equal strength [and at equal distances from the subject], multiply the guide number by 1.4.

With three flash units, multiply the guide number by 1.7.

The usual guide numbers do not apply directly to bounce flash because the flash is both diffused and travels a greater distance [from flash to reflecting surface to subject]. However, there is a rule of thumb for calculating approximate bounce exposure. Find your *f* stop in the usual way, using the normal guide number and the direct flash-to-subject distance. *Then give between two and three stops more exposure when you take the picture.* Obviously, exposure may vary depending on the value and reflecting ability of the reflecting surface, and on the distance between the flash and the reflecting surface. [The greater this distance, the more scattered and less intense the light will be.] But the above rule gives you a good starting point.

Electronic flash or flashbulbs?

Should you use electronic flash or flashbulbs? An intelligent decision depends on your answer to two important questions: [1] How often am I going to use flash? [2] What kind of pictures am I going to take? There is no one perfect kind of flash equipment, and both flashbulbs and electronic flash will do some jobs better than others. Let's take a closer look at the advantages and disadvantages of each.

Why use flashbulbs?

If you expect to shoot only a few flash pictures over the course of a year, then flashbulbs may provide the most economical type of flash

Conventional flash is often the ideal type of illumination for pictures which require such a large area to be illuminated that it would be impractical to do the job with either electronic flash or floodlights and spotlights. For this brewery picture Arthur d'Arazien used thirty powerful flashbulbs arranged at strategic points throughout the interior. This gave him the light he needed to shoot the long scene with a sufficiently small aperture to get the depth of field that he wanted. [Courtesy P. Ballantine & Sons]

Electronic flash is chosen by many photographers for its action-stopping ability. Philippe Halsman made this "frozen action" picture of dancer Eric Hawkins by using electronic flash. The extremely rapid blink of the electronic flash produced a sharp, clear image of the subject even though he was in rapid motion.

for you to use. The initial cost of good electronic-flash equipment is considerably higher than is the cost of conventional flash equipment. Also, it is relatively heavier and more complicated, and requires more careful upkeep. So unless you're going to do a sizable amount of flash shooting, electronic flash may not be worth while.

Do you need maximum light output? Are you going to be photographing large interiors or groups where you need all the illumination you can get? If so, flashbulbs may be your best choice. On the basis of the light output per pound, conventional flash equipment usually will deliver more intense light.

With most cameras having a focal-plane shutter you can only synchronize electronic flash at speeds of about 1/60 second and slower. If there is bright light in the room it may register a "ghost" image on your film. This is a second exposure superimposed on the electronic-flash exposure. Therefore, with focal-plane cameras [many good-quality 35-mm cameras have focal-plane shutters], you may find it more convenient to use flashbulbs when shooting under conditions that might give you ghost images. By choosing a fast shutter speed, you can eliminate the "ghost."

However, ghost images are not a problem with electronic flash synchronized cameras having *blade-type* shutters. These permit flash synchronization at any shutter speed. Therefore, to prevent ghost images, just select a shutter speed fast enough to keep the existing room light from registering an image.

Why use electronic flash?

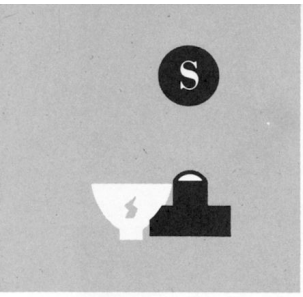
Electronic flash offers great advantages in economy and convenience if you shoot many flash pictures. Since each tube on a typical electronic-flash unit is good for 10,000 flashes or more, the cost per flash is very low—even when you take into account the initial cost of the equipment.

With electronic flash there are no flashbulbs to carry and dispose of after firing. When you are shooting rapidly, the time-consuming process of putting bulbs into the flashgun and removing them after they have been fired is eliminated. [Although electronic-flash units take at least a few seconds to recharge after each shot, this usually is quicker than changing bulbs. And it's much more convenient!]

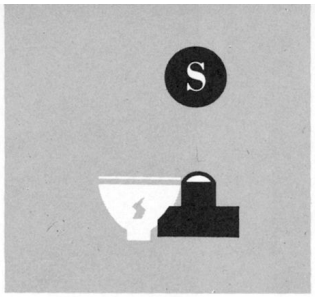
The very brief flash duration of electronic flash gives it great ability to stop action and minimize the danger of camera shake. In fact, high-speed action photography and electronic flash are practically synonymous, so frequently is "speedlight" used for this purpose.

Electronic flash is an excellent choice for color photography. The color quality of the light produced by an electronic-flash unit is close to that of daylight and requires little or no filtering. This means you can standardize on a daylight-type film and use it both for outdoor and indoor shooting. It also means that electronic flash is a good choice for fill-in lighting for outdoor color pictures.

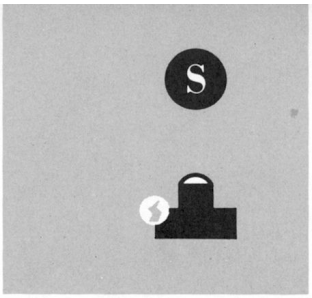
For these reasons of economy, convenience, action-stopping power, and color quality, many professional photographers choose electronic flash for all or most of their flash shooting. You'll find portable electronic-flash units slung from the shoulders of press photographers, photojournalists, candid wedding photographers, industrial photographers working on location, and many other professionals. On the other hand, you'll find many portrait, advertising, fashion, and all-purpose studios fitted with the larger, heavy-duty electronic-flash units.



1 Direct flash on camera: The simplest way to use flash is with the flashgun fixed to your camera. This gives flat lighting with little modeling on the face. Although usually not the most interesting type of lighting, it may be a good choice when you must shoot quickly. Notice that Garfield posed the little girl far enough away from the wall so that no unpleasant background shadow is visible.



2 Diffused flash on camera: For this picture Garfield placed a piece of spun glass in front of the flashbulb to diffuse its light. Although the effect is similar to the direct-flash example, the shadows and highlights are slightly softened. Also, the diffusing material acts as a safety shield, protecting the subject from the possible shattering of a faulty flashbulb. Thus it's a good accessory to use for close-up portraits. The exposure will vary, depending on the material of the diffusion screen, and is best determined by personal test.



3 Reflectorless flash on camera: Here's a third way to vary your flash-on-camera pictures. By removing the flash reflector and shooting with the light of a bare flashbulb you can get a softer light. The shadows here are lighter and contain more detail than in the direct-flash example because some of the light is bouncing off the walls and ceiling, thus acting as "fill." Direct light, too, reaches the subject, adding sparkling highlights to the eyes. This bounce-plus-direct-light combination gives a pleasing illumination for portraits. [Increase exposure about two stops.]

Seven ways to shoot flash

The best way to learn to use flash, and to be able to predict what the results will look like, is by a combination of experience and common sense. Keep in mind that the quality, intensity, and direction of flash can be controlled. Just as with floods and spots, you can use flash in a direct head-on position, move it up or down, place it to one side or another, or even bounce it from a reflecting surface to create more interesting pictures. You can use more than one flash unit just as you can use more than one flood or spot.

To use flash creatively, you simply need to apply intelligently the techniques we've already demonstrated for shooting by daylight and by floods and spots. As we've pointed out, light is light, whatever the source, and a mastery of the basic lighting techniques will help you take any type of photograph with any type of illumination.

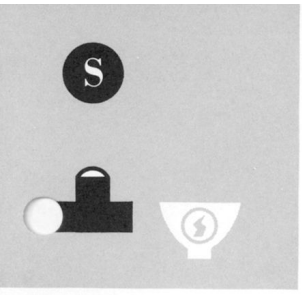
However, there are a few basic pointers to keep in mind when you use flash. Follow these suggestions and you will avoid some of the most common mistakes and causes for disappointment.

Beware of *reflections*. Flash is a powerful light, and it will be picked up and reflected by any shiny surface such as a mirror, polished wood, smooth metallic surfaces, glassware, etc. Try to select a shooting angle so that these surfaces won't bounce the flashbulb's light directly back into your camera, causing unpleasant and distracting "hot spots" [harsh, overly bright reflections].

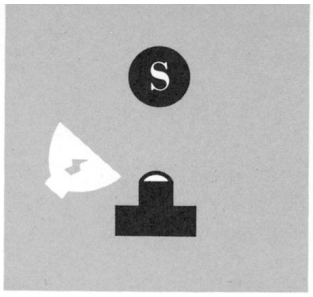
As a general rule, locate your flash unit *above* your subject. What we said about natural-looking lighting for floods and spots goes for flash, too. We are accustomed to see things by daylight, and the sun usually throws light on the subject from above. So unless you want the weird, unnatural effect of low-angle lighting, keep the flash unit at least at eye level or higher. This means you shouldn't shoot up from a kneeling or sitting position when you have a flash attached to your camera. [However, with an extension cord you can hold the flash at arm's length and enjoy greater freedom of action.]

Also, be careful of background shadows. Generally, it's best to keep your subject about five to six feet away from a wall or other background. We'll demonstrate other ways to minimize or eliminate background shadows, but this simple rule of keeping adequate distance between subject and background often will solve the problem. On the other hand, don't place the subject *too* far from the background. Usually you'll get a more pleasing picture if some light from the flash falls on the background and prevents it from going totally black.

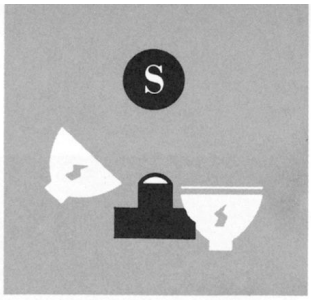
For examples of various uses of one or more flash units, study the accompanying photographs [and matching diagrams] by Harry Garfield. They show clearly what can be done with both single and multiple-flash setups. They also indicate techniques for changing the quality of the light and reducing background shadows.



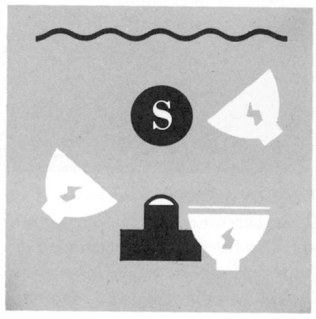
4 Bounce flash: Bounce flash is similar in effect to bounce flood, and offers similar advantages of relatively soft, even lighting. With some flash units you can tilt or swivel the reflector to bounce the light. With other units you must remove the flashgun from the camera and hold it by hand, pointing it at the reflecting surface. [Calculate the exposure for direct-flash-to-subject distance, then increase your exposure from about two to three stops.] Bounce flash often is used for fast, candid-type location shooting because of its ease, convenience, and natural-lighting quality.

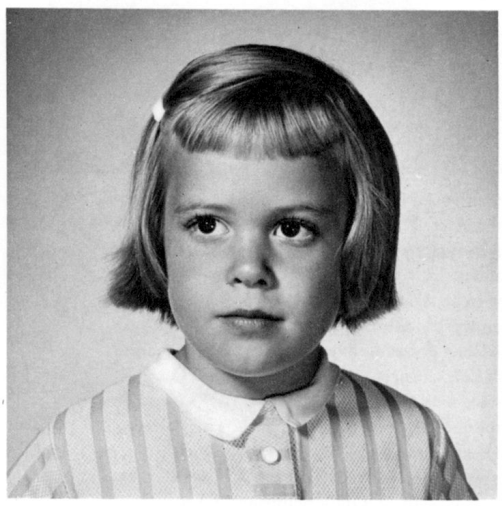


5 Direct flash off camera: Removing the flash unit from your camera and directing the light at the subject from the side produces considerably more modeling than does the flash-on-camera method. It also throws the background shadow out of sight. You need an adequate amount of extension cord so that you can hold the flashgun at arm's length. Of course, you can hold the light higher, lower, or more to one side or the other, as you see fit.

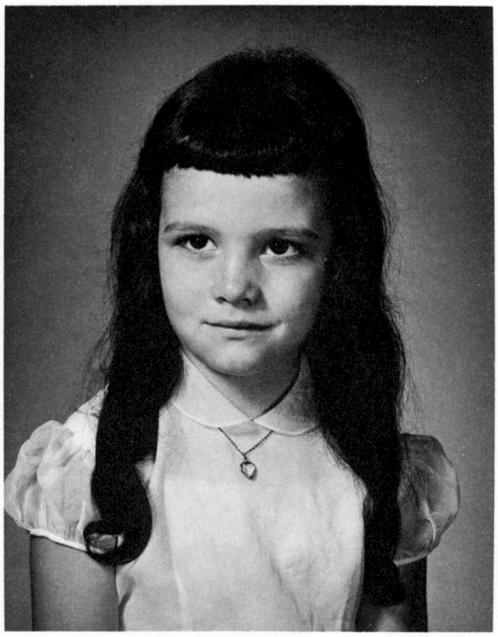


6 Two-flash setup: For a less contrasty effect, you can use a combination of mainlight and fill-in. This arrangement is particularly useful for portraiture–especially in color where you want a low lighting ratio. A good method is to use one diffused flash on your camera as a fill, and a second flash on an extension [held in your hand] to provide the mainlight, as Garfield did here. Alternatively, one or both flash units could be attached to light-stands placed in the proper position.





7 Multiple flash: Here the photographer used a mainlight, a fill-in light, and a third light to illuminate the background. The fill-in light was attached to the camera. The mainlight and background lights were slave units. The result is similar to a three-light portrait setup with studio floods–the shadows are well filled and there is good separation between subject and background. However, we recommend that you first thoroughly master the simpler flash techniques using one or two units before attempting the more complex multiple setups.



Flash errors and how to avoid them

When you're shooting flash, errors can occur much more easily than with floods and spots or outdoor lighting because you don't really get a chance to see and study the light. The only way to prevent mistakes with flash is to be aware of the pitfalls and take steps to avoid them. The child portrait at the left, by Harry Garfield, is a correctly lighted and exposed flash picture. In the other pictures on these pages Garfield illustrates some of the most common difficulties you may run into when you work with either conventional or electronic flash, and points out simple solutions.

Overexposure: This can happen if you use the flash too close to the subject. Notice that almost all the tones in the child's face and dress have been lost. These areas have the blank, washed-out look characteristic of flash overexposure. The solution is to allow enough distance between the flash and your subject, and also take care to select the correct guide number for the film, flashbulb, and shutter speed you're using. Cutting down the intensity of the light with a diffusion screen also can help in close-up shooting.

Underexposure: This common error may have several causes. The room may be too large or the reflecting surfaces too dark for the guide number –calculated for a room of *average size* and *reflecting ability*–to be accurate. You must compensate for such variations from the average by increasing exposure. You also can get underexposure if you miscalculate your flash-to-subject distance. Sometimes, too, flashbulbs may fire slightly "out of sync"–the shutter may not be fully open when the flash is brightest. If this keeps happening, have your camera's synchronization checked. Also, weak batteries may cause loss of sync and underexposure. Be sure, too, that you are using the proper flashbulb at the correct sync setting.

Uneven reflector coverage: Faulty flash-reflector coverage results in a "hot spot" on the girl's forehead, with the light falling off rapidly on the lower part of the face and on the dress. The solution is to use a reflector that is properly designed and adjusted for your bulbs. If it is the wrong size, for example, it won't focus the light rays properly, the light won't cover the subject as it should, and "hot spots" may result. Also, if the reflector itself gets badly dented or tilted out of proper alignment, it may give uneven coverage.

Bad eye shadows: Bouncing the flash from the ceiling directly above the subject's head may produce deep shadows in the eye sockets and under the nose and cheeks. The solution is to choose a different bounce point—on the ceiling well in front of the subject, off a nearby wall, or the intersection of the wall and ceiling. If you are shooting a close-up portrait, aim your flash so it bounces off the wall or ceiling *behind* you and your camera.

Unpleasant tone mergers: If the subject is against a very dark background or is in deep shadow, you may get undesirable tone mergers—as here, where the child's dark hair and the shadows on the side of her face and under her chin blend into the background. To overcome this difficulty, pick a lighter background, or place the subject nearer the background so that some of the light from the flash falls on it.

Bad background shadows: When light from the flash hits the background, be sure it doesn't cast a shadow visible to the camera, as happened here. The dark shadow of the child is a distracting element because it is such a strong, dominant area of black. One solution is to change the position of the flash so that the shadow of the subject falls *outside* the picture area. With a flash unit attached to the camera this isn't possible, so you must avoid posing the subject very close to the background. Still another way to minimize the background shadow is to use bouncelight.

Flash photography in color

It's easy to take good flash pictures with color-transparency or color-negative film. The basic methods we have discussed in this lesson apply to color shooting as well as to black and white. We suggest you try color, too, while you are getting acquainted with flash.With color-negative film and flashbulbs or electronic flash, follow the manufacturer's recommendations about filters. With color-transparency film, follow the advice we give you here.

Conventional flash

With flashbulbs you have a choice of three ways to shoot color. You can use a special flash-balanced color film, blue-tinted "daylight" flashbulbs, or a conversion filter.

1. Type F color-transparency film is designed for use with clear white flashbulbs. You don't need a filter with this combination.

2. Blue-tinted "daylight" flashbulbs emit a light similar in quality to daylight, and can be used with daylight color-transparency films. Thus you can use the same film outdoors or indoors [with blue-tinted flashbulbs] without a conversion filter. You also need blue flashbulbs when you want to fill in shadows of outdoor subjects in color or shoot indoors with mixed daylight and flash.

3. You can also use a daylight film plus a flash conversion filter that balances the light from clear white flashbulbs to the color characteristics of daylight film. See your Technical Manual for a chart giving the recommended flash conversion filters for a variety of popular color-transparency films.

Electronic flash

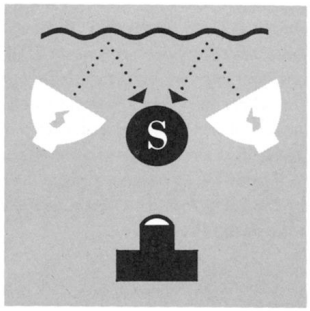
If you plan to shoot much color with flash, then electronic flash is probably your best bet. As we have already mentioned, the color quality of electronic flash is very close to that of daylight. Therefore, you can standardize on a daylight color-transparency film and use it indoors [with electronic flash] or outdoors [in daylight]. And for your outdoor shooting, electronic flash is excellent when you want to add flash fill.

With some electronic flash-and-film combinations, you may need to use a slightly warming or cooling filter to get the most accurate color results. The exact degree of filtering you may need is best determined by tests with your own equipment.

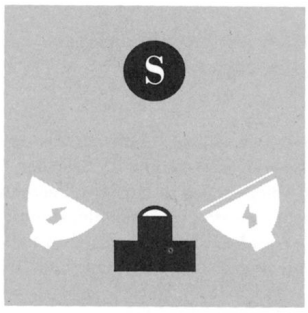
When shooting flash, either conventional or electronic, remember that the color of surrounding walls or objects can have a strong effect on the colors in your picture. Even when you shoot direct flash, some light bounces off nearby surfaces and is reflected onto the subject. A wall that is just slightly "off white" can significantly change the color in your picture. So avoid getting close to colored walls or any large colored surface. With bounce flash in color, of course, use only neutral white reflecting surfaces.

How your Faculty uses flash

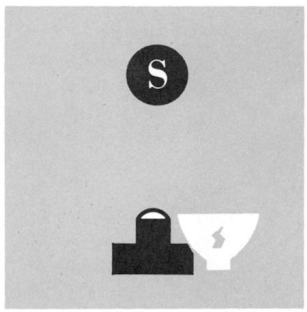
Here and on the two following pages we show you flash photographs by members of your Faculty. These pictures indicate the range of effects you can achieve with flash and some typical picture-taking situations in which it is useful. Study each photograph and check the lighting in it against the lighting setup in the accompanying diagram. See if there are some ideas for using flash here that you can apply in your own pictures.



Bounce flash can be used to give a soft, light feeling to a picture. For this photograph of four ballet dancers, Bert Stern reflected light from studio electronic-flash units off a pure white background, while exposing generously to get detail in the shadowed figures. The pose of each dancer shows up clearly against the light, overexposed background in this graceful composition of figures apparently floating in space. By bouncing his flash, Stern was able to make it evenly cover the wide area needed to include all four dancers. The grainy effect was deliberately achieved by overexposure. [Courtesy *Vogue*, ©1961, Condé Nast Publications, Inc.]

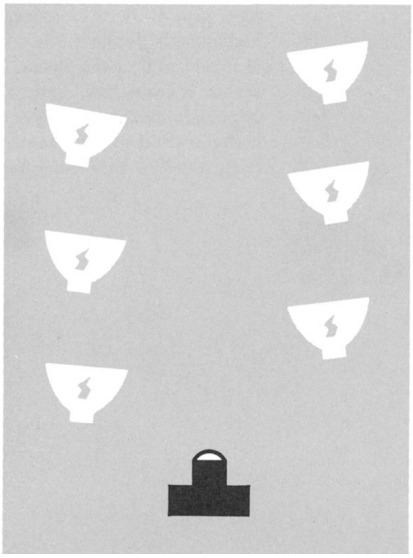


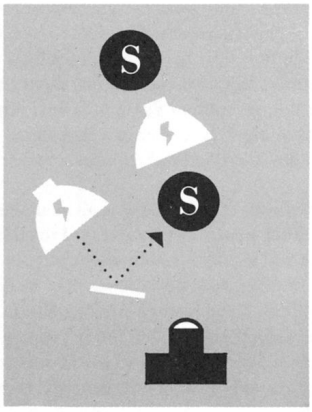
Electronic flash is the obvious choice when you want to stop very rapid action. Philippe Halsman chose this type of light for his famous series of pictures showing celebrities jumping, because its rapid blink made it certain he would freeze all the motion. Here dancer Ray Bolger is stopped in midair in a characteristically fantastic contortion. The mainlight was located a little to the left of the camera, with the fill-in light [a flash unit with a spun-glass reflector] a little to the right. The result is relatively even lighting with just enough shadows to model the figure slightly.



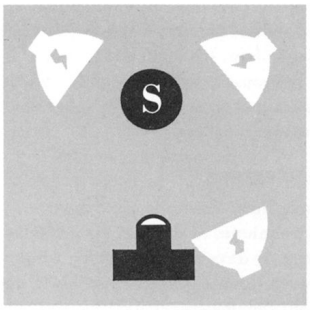
Direct flash on the camera often is used in news photography and other picture-taking situations where the photographer must shoot flash quickly. Joseph Costa had only seconds to take this picture of President Franklin Delano Roosevelt surrounded by secret service agents. It was a dark, rainy day during Roosevelt's last presidential campaign. Because of the poor light Costa needed to use flash. A single flashgun attached to his camera gave full frontlighting.
[Courtesy New York *Daily News*]

The technique of *open flash* was used by Joseph Costa in this photograph of the interior of the Brooklyn Battery Tunnel during its construction. With this technique you open the shutter of the camera as for a time or bulb exposure and *then* fire the flash; the flash unit does not need to be connected to the camera. For this shot, men were stationed along the tunnel with flashguns, as the diagram indicates, and fired their bulbs at prearranged intervals while the shutter remained open; the camera rested on a tripod. After all the bulbs were fired, the shutter was closed. Naturally, you can use this technique in relatively low-light situations only, where the problem of a "ghost image" is slight. With flashbulbs and this open-flash method, you can illuminate huge areas—even light a scene yourself without an assistant. Set your camera for a time exposure and walk around the scene firing as many flashbulbs as you need. Then return to your camera and close the shutter.
[Courtesy New York *Daily News*]

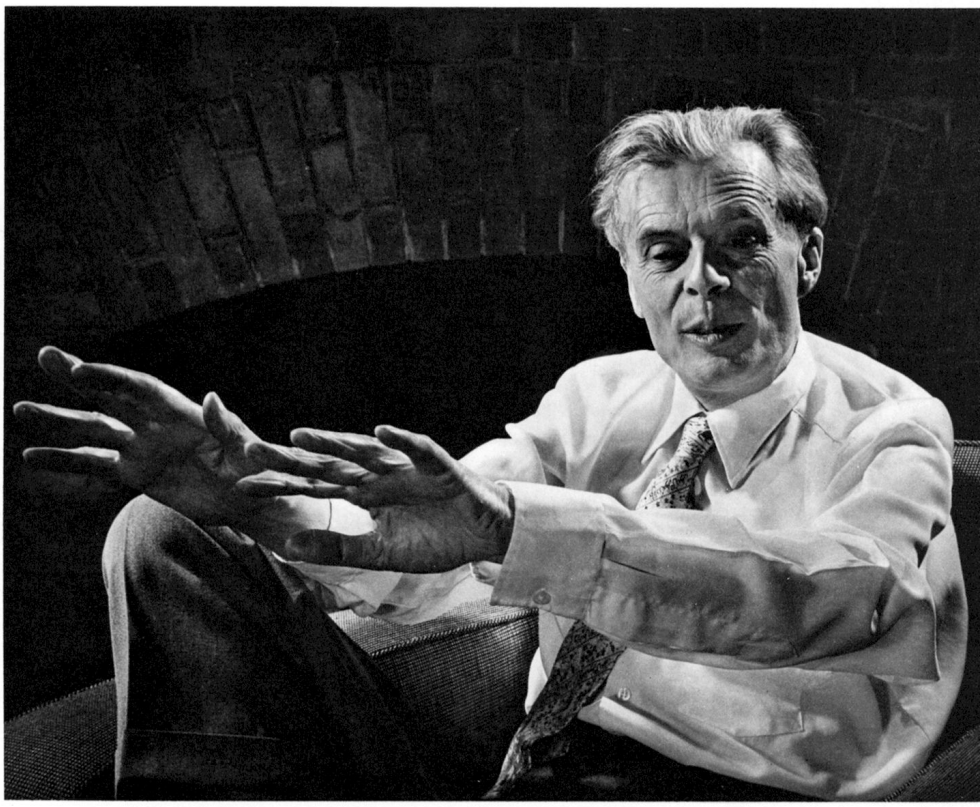




Small portable electronic-flash units are often used by Richard Beattie when shooting on location. These playgoers in a Broadway theater lobby were taken with one electronic flash bounced off a white cardboard from the front and another unit located between the front couple and the back couple to provide rimlighting. This gives good separation between the two couples and accentuates the face of the male model in front. [Courtesy Kent Cigarettes, P. Lorillard, Inc.]



Electronic flash can catch the significant fleeting gesture or expression which could never be caught in a posed portrait taken at a slower shutter speed. Here Philippe Halsman used a twin-lens reflex camera and electronic flash to capture a characteristic gesture of author-philosopher Aldous Huxley. He used a flash unit at each side and slightly behind the subject, plus a third unit close to the camera as a fill. The two lights at the sides provide modeling, accentuating the subject's skin texture while at the same time separating him from the dark background.
[Courtesy *The Saturday Evening Post*, ©1958, The Curtis Publishing Co.]



Available light

Available light is the illumination that already exists in a scene. It does *not* include daylight scenes outdoors. Also, as usually understood, it does *not* include light from any special photographic light source such as flash, flood, or electronic flash. But it does include illumination from just about every other source: wall, table and floor lamps, ceiling fixtures, household and fluorescent bulbs, neon signs, windows, skylights, candles, fireplace flames, etc. In other words, available light is "the light that is," the light you'll find in homes, offices, stores, factories, restaurants, night clubs, and auditoriums. [Although outdoor daylight is not included, outdoor scenes at twilight or after dark often are considered available-light situations if you are shooting brief exposures rather than time exposures.]

Despite the diversity of light sources, all available-light pictures have one thing in common: the brightness of the illumination in the scene is less than you would normally encounter shooting outdoors in bright daylight. Sometimes the brightness may be only slightly less, as in a well-illuminated factory or office. But in other places the available light may be dim indeed, as in a dark restaurant or a subway station. Therefore, special methods involving film, developer, exposure, and printing are required for successful available-light photography.

Why use available light?

Available-light photography offers three important advantages: the mood and realism of available light itself, the freedom it gives the photographer to shoot unencumbered with lighting equipment, and its unobtrusiveness [making it the logical choice for candid shooting]. Let's look at these advantages in detail.

1 It communicates mood and realism: From the harsh glare of a circus spotlight to the soft glow of diffused daylight falling through a curtained window, available light creates moods and effects that can greatly add to the emotional impact of a photograph. Available light can be dramatic, ominous, exciting, soothing, romantic, beautiful, harsh, gentle, or pitiless. Some available-light pictures are dark and full of shadows, but others may be light and airy–high key in their effect. The infinite variations of available light are subtle and lovely.

Above all, available light is *authentic*. A picture taken by available light can vividly convey the feeling that "this is the way things looked." Even a skillfully lighted flash or flood shot often looks artificial and contrived by comparison with a good available-light picture. Therefore, for realism–to capture the authentic flavor of time and place–available light often will be your best choice.

2 It gives the photographer freedom and mobility: When you can record a scene by the light that is already there, you can shoot more quickly and move about more easily. You can photograph what appeals to you, without having to set up floodlamps, change flashbulbs, or wait for an electronic flash to "recycle" for another shot. Naturally, this makes for a highly mobile and, if necessary, rapid type of photography. Many photographers like available-light shooting because of this freedom and convenience.

3 It is less annoying or disturbing to the subject: When you shoot with available light, there are no floods or spots to shine hotly into your subject's eyes, no popping flashbulbs or blinking electronic flash to startle or annoy him. As a result, your picture-taking can be more spontaneous. Your subjects can more easily relax and lose their self-consciousness. After a time they may even forget that a camera is being pointed at them, allowing you to shoot the natural, unposed kind of pictures that are the hallmark of available-light photography. Of course, for purely candid shooting, with the subject completely unaware that his picture is being taken, available light often is the *only* method possible for you to use.

Because of these great advantages, available-light photography has become increasingly popular and important in recent years. It has long been used by photojournalists. Alfred Eisenstaedt, a member of your Faculty, was one of the early pioneers in available light, and has continued to shoot the great majority of his pictures and picture stories by it. His shots in this section show you some of the beautiful and subtle effects possible with "the light that is," as well as the natural, spontaneous way it enables you to photograph people.

Other members of your Faculty, too, including Richard Avedon, Irving Penn, and Bert Stern, frequently shoot by available light. Today, available light is used in press, industrial, and advertising photography, editorial illustration, portraiture, and even in such specialized fields as fashion photography. In fact, whenever a professional photographer wants a candid, realistic quality in his pictures he is likely to use available light.

When not to use available light

As must be evident by now, no one lighting method is the answer to *all* photographic problems. There are some available-light situations when the light is so weak that you can't possibly get the picture you want without additional lighting. For example, if you need great depth of field in a scene, want to stop fast action completely, need great sharpness and clarity, or must have precisely controlled lighting effects, then flash or flood may be your best choice.

Formal portraits, many types of product pictures, elaborately staged advertising or illustration photographs, indoor sports shots, photographs of interiors where the purpose is to show maximum detail–these are just a few of the kinds of pictures where flash or flood may do the job better than available light. It's up to you to make your own decision in each case. You must weigh the candid, realistic effect of available light against the advantages offered by other types of photographic lighting, and choose accordingly.

The ease of available-light photography

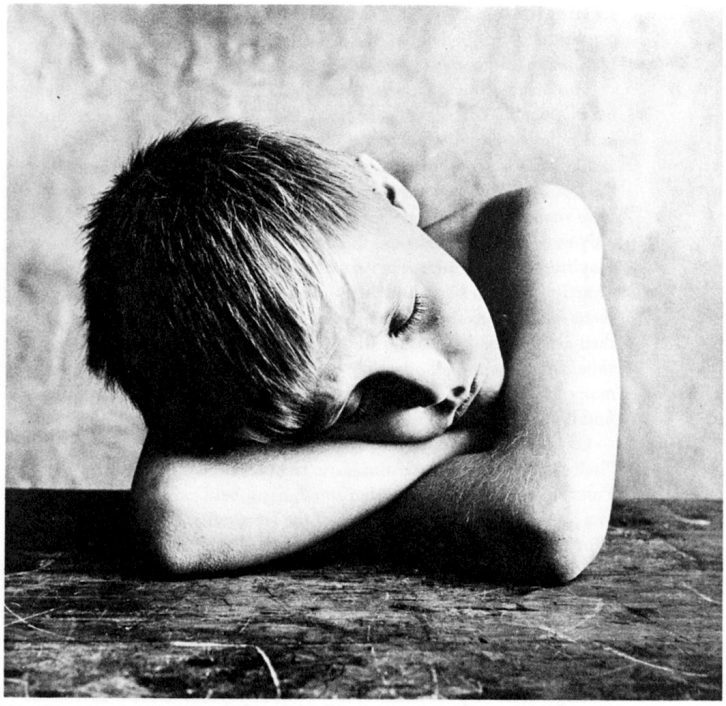
Thanks to modern cameras, lenses, films, developers, and an ever-growing body of know-how, the techniques of shooting by available light are relatively simple. In the early days of photography, when lenses were slow and films were even slower, it was impossible to make hand-held pictures indoors without supplementary lighting. But today an experienced photographer can achieve pictures of good technical quality in all but the most poorly lighted situations, and there is scarcely any location so dim that you can't record some kind of usable image.

However, like any other kind of photography, available-light photography does require careful attention to detail, both in shooting and in developing and printing. In the following pages, we'll explain the basic tools and methods that make available-light photography one of today's most fascinating ways to use a camera.

This striking fashion shot was made by Richard Avedon in Paris at dusk. The basic illumination came from nearby lamps of a bridge over the Seine. [Similar lamps and their multiplied reflections can be seen out of focus in the background.]
To create the bright rim of light around the model and her hat, separating them from the background, Avedon turned on the headlights of an automobile and pointed them at the model.
[Courtesy *Harper's Bazaar*]

The realism and naturalness of available light is well demonstrated in this photograph by Alfred Eisenstaedt. Diffused daylight coming from several windows around the room illuminates a young flutist and his listening sister. The soft shadows and highlights modeling the two figures, the highlights on the polished floor, and the gradually darkening tone of the rug all help to create a strong sense of depth.
[Courtesy *Life* magazine, ©Time, Inc.]

Candid theater pictures are part of the exciting realm of available-light photography. Because stage lighting makes use of powerful spots and other lights, it often tends to be strong and contrasty. However, it can be relatively even, too, as in this picture Alfred Eisenstaedt made of opera star Joan Sutherland. Here banks of footlights in front of the actress served as fill-in lights, giving soft, open shadows. With complete freedom to shoot when he wished, Eisenstaedt was able to catch the unposed attitudes, gestures, and expressions of the singer.
[Courtesy *Life* magazine, ©Time, Inc.]



The illumination from a window provides a strong, form-revealing light in Irving Penn's picture of a resting boy. Very directional, the window light comes from the 90-degree side position, throwing dark and powerful shadows that model the boy's head, arms, and face, giving his form a sculptured, three-dimensional quality.
[Courtesy *Vogue*, ©1948, Condé Nast Publications, Inc.]

Basic available-light techniques

In available-light photography there are five factors you must give special consideration–the camera, the film, developing, exposure, and printing. Here we will tell you what you need to know about each of these to make good pictures. In future lessons you will also learn more that you can apply in working with available light.

The camera

The ideal camera for available-light photography is a small model that you can shoot hand-held. It should have at least a moderately fast lens–*f*/3.5 or faster. Other valuable features on your camera are a bright viewfinder [for easier focusing and viewing in dim light], and a choice of medium and slow shutter speeds.

For years the 35-mm rangefinder camera has been preferred by many photographers for available-light shooting because it often has all these attributes. Also, the fastest lenses have been designed for the 35-mm camera, and you can operate it rapidly and unobtrusively. Its large film capacity is a definite advantage, especially in shooting candid, uncontrolled situations where you may have to take many pictures before you get one that is just right.

The bright optical viewfinder of a good 35-mm camera is excellent for composing and focusing in poor light. However, the 35-mm single-lens reflex camera [called SLR for short] is widely used for available-light work, too, by photographers who prefer "through-the-lens" groundglass viewing and focusing. Modern SLR cameras have such convenient features as an "instant return" mirror [which only momentarily blacks out the image] and an "automatic diaphragm." This mirror is very helpful if you want to shoot candids or action with an SLR, and the automatic diaphragm enables you to focus with the lens wide open [to get the brightest possible image], then automatically stops down the lens to a preset aperture when you shoot. Also the rangefinder spot and the fine focusing grid found on many SLR cameras give you alternate focusing methods that you may find helpful in available-light photography.

Of course, you can use many other types of cameras, including the "half-frame" 35-mm, subminiature, twin-lens reflex, and even Polaroid cameras. In general, a small, hand-held camera is preferable to a large, heavy camera because of the freedom and mobility it affords. The chief consideration is to have a lens fast enough to let you shoot in relatively dim light without putting your camera on a tripod for a time exposure. A tripod sometimes is necessary in available-light work, but it is difficult to be candid and unobtrusive when you use one. Most photographers prefer to work without a tripod if they can.

Regardless of your camera, *it is most important to use a lens shade for available-light shooting*. This will minimize the risk of flare in the picture. There is considerable danger of flare when a number of lamps or other light sources are scattered about the room.

A reliable exposure meter also is a necessity for consistently good pictures. Available light can vary greatly in intensity, and even a trained eye can be fooled. Therefore, rely on a meter, not on guesswork. Many exposure meters have a light "baffle" which you can remove to increase their sensitivity in dim light such as you often encounter in available-light photography. Others have a two-position "Hi-Lo" switch. For dim light, use the "Lo" setting. A booster cell can be added to some models to increase their sensitivity still further. For accurate exposure readings in very dim light, a cadmium-sulfide meter, which is highly sensitive, can give you readings even when illumination is very weak. For details, see your Technical Manual.

Finally, a properly adjusted neckstrap can be very helpful. At the slow shutter speeds you often have to use when taking pictures in dim light, it is vital to hold your camera very rigid. Review "How to Hold a Camera" in the lesson "Your Camera and How It Works."

The film

For the best quality in available-light photography, *choose a film that's fast enough but no faster*. The faster the film, the grainier and less sharp it tends to be.

Many beginning photographers make the mistake of using a very fast film when they shoot by available light. As a result, their pictures are often too grainy and fine detail is lost. In relatively bright available light a medium-speed film will often give you better quality.

For the most versatile shooting you should use one of the "standard" high-speed films listed in your Technical Manual. They will permit you to shoot pictures in a wide variety of available-light situations, and give you a sufficiently wide range of shutter speed and aperture combinations. When properly exposed and developed, they can yield pictures of excellent quality.

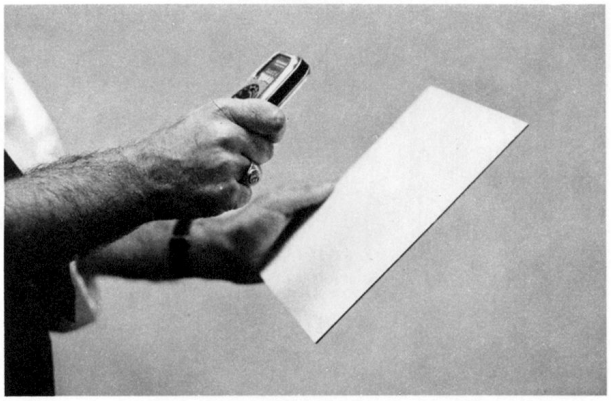
Save the ultra-fast high-speed films for those occasions when you absolutely need the extra speed–either because the light is very dim, or because you must have a fast shutter or small lens aperture.

As in your general shooting, the best idea is to standardize–select a combination of one available-light film and developer. Then learn their characteristics thoroughly, so that you know how they perform under different lighting conditions. Use a different film only when the light level makes it absolutely necessary.

Developing

The available-light photographer today can enjoy the benefits of numerous "high-energy" developers. These often give best overall technical quality *when you rate your film at a higher exposure index than the official ASA speed number*. See your Technical Manual for a list of these developers plus time-and-temperature developing combinations and suggested exposure indexes.

Although many of these developers permit you to expose your film at a rating higher than the ASA rating given by the manufacturer, you may encounter situations where even this film speed is not enough to permit you to take pictures. However, it may be possible to rate your film even higher, and then *push* during developing. Pushing



When the available light is too dim for an accurate meter reading, a good emergency procedure is to divide by five the film exposure index at which the meter would normally be set and then base your exposure on a reading taken with a reflected-light meter from a pure white surface. In this illustration, the photographer is using the white back of his 18 percent standard gray card. You can also improvise with a white piece of paper or even a tablecloth.

means giving prolonged, forced development. Although a valuable emergency procedure when you have to shoot under very poor light conditions, pushing results in a loss of quality–increased graininess, more contrast, and less image sharpness. Modern films do not withstand pushing well, and you are always better off when you develop your film normally according to the developer manufacturer's recommendations, even if it means shooting with a faster film.

Developing available-light negatives requires strict attention to time-and-temperature controls. Developer temperatures must be kept stable during the entire length of the developing period and should be measured with an accurate thermometer. Timing devices should be equally accurate, and they must be watched closely. Remember that minor variations can make a big difference if the total developing time is short. For example, a 30-second delay in removing the film from the developer is a 12 percent increase in developing time if the total development period is supposed to be four minutes long. And with many of the high-energy developers for available light, developing times are relatively short.

Exposure

A basic problem when you shoot pictures with available light is to get adequate detail and contrast in important shadow areas without overexposing so they block up–become too dense in the negative and difficult to print. The ideal available-light picture has good detail in both highlights and shadows, and this is what you should strive for when determining your exposure. You will then have a full range of tonal values and a natural-looking photograph.

You can use either an incident- or reflected-light meter. However, with a reflected-light meter, be careful you do not get readings only for the brighter highlight areas. Make close-up readings of important shadow areas, too.

Available-light situations often present problems in lighting contrast. Sometimes scenes are evenly lighted and thus easy to handle; you can use a compromise exposure that gives you good detail both in shadows and highlights. But often you may find that the lighting is very contrasty–as in a dark living room illuminated by pools of lamplight, or a street at night lighted by store signs and windows.

As you know, your film has limits–it cannot record as wide a range of brightness as your eyes can see. In very contrasty lighting situations you must decide which are the most important areas of the picture–the highlights or the shadows. If you cannot expose to get good detail in both, you must choose an exposure that favors one or the other, then rely on printing to give you a good final result. For example, you can dodge shadow areas that got too little exposure, or print in blocked-up highlights.

When photographing people, it's important to record skin tones so they look natural. Therefore, when taking available-light pictures of people, a close-up reading of the face may be your most valuable guide to good exposure. After taking a reading for skin tones, open up your aperture from 1/2 to 1 1/2 stops, depending upon the amount of shadow detail you want to record.

If you cannot get close enough to the subject to make a reading [or do not wish to because you want to be unobtrusive], you can take a substitute reflected-light reading from your hand by placing it in approximately the same light as that which strikes your subject. If you are using an incident-light meter, take your reading in light like that falling on the subject.

If the light is so dim you find it hard to take a reading by ordinary means, try the following: First divide the exposure index of your film by five and set the reflected-light meter at the resulting number. For example, if you are shooting with your film speed set at 200, change it on your meter to 40. Then simply take a reading from a pure white surface such as a tablecloth, a white piece of paper, or the white back of your standard gray card. This technique is illustrated in the photograph.

Learn to trust your meter, because it is far more accurate than your eye. Don't get into the bad habit of opening up a stop or two "just to be sure." It leads to overexposure, and *overexposure is the archenemy of good technical quality in available-light pictures*, particularly those made on 35-mm film. Overexposure produces excess grain, builds up contrast, and makes the picture less sharp than it should be.

As we have indicated, it's a great help to standardize on your working procedure. This means working with *one* film at *one* exposure index with *one* developer until you learn its characteristics thoroughly. Only after you are thoroughly familiar with one film-developer combination should you start experimenting with others.

Printing

Some available-light negatives have the unhappy quality of being both contrasty and flat at the same time. That is, the highlights may be extremely bright–even blocked up–while the shadow areas may lack detail because of underexposure. To produce good pictures from these negatives you need a solid understanding of printing techniques–especially of *dodging* and *burning in*. You also need a thorough knowledge of variable-contrast printing papers, which permit you to get different degrees of contrast within a picture by the use of filters in enlarging.

Many photographers who do much available-light work also prefer the use of an enlarger with a contrasty light source–the double-condenser type giving the maximum in this respect. To build further contrast in flat shadow areas, they will also use their paper developer at full strength rather than dilute it as the manufacturer often recommends for normal printing.

Fortunately, the really difficult negatives represent the extreme situation in available-light work. With most pictures taken in high to moderately bright available-light situations, good negatives are surprisingly easy to produce and to print, if you follow the procedures we have given you here.

Three keys to successful available-light photography

There are three important things you should watch for if you want to take good available-light photographs. These are: adequate *separation* between your subject and the background, *correct lighting* on your subject, and *moments of minimum motion*, when your subject can be recorded sharply even at the relatively slow shutter speeds often required with this type of photography. The pictures by Alfred Eisenstaedt on this page demonstrate these three points.

1 Separation: This is one of the greatest problems in available-light photography. Each time you take a picture, you must pay close attention to the background as well as the subject. If the background is dark and the subject has dark hair or dark clothes, these areas of similar value may merge. Since you may not be able [or may not wish] to direct your subject–this might ruin the candid, spontaneous quality of your picture –the only alternative is to watch and wait until the subject moves in front of something, or into an area of light, where separation is achieved. Needless to say, sometimes this never happens and, if you are not to miss the picture, you have to shoot and rely on printing procedures to establish the separation.

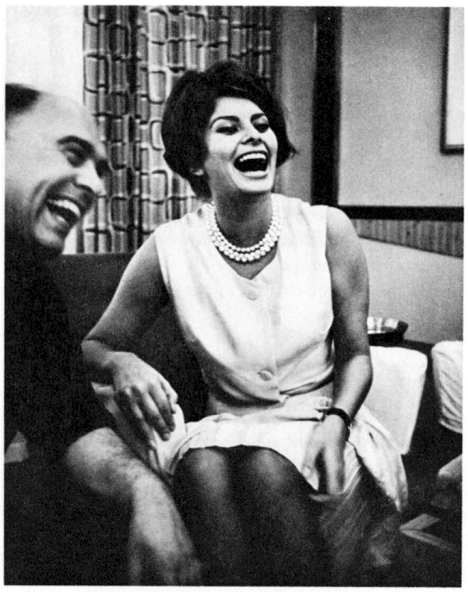
2 Correct lighting: One of the problems of candid photography is that your subjects keep moving in and out of areas of light. For example, if a subject is sitting in a chair in a living room and talking animatedly, his head may turn from side to side, so that at some moments the available light will hit it to good advantage and at others it will not. You must train yourself to recognize and take advantage of the moments when the light is best for your picture.

The experience you gain in working with floods can be of great aid in taking available-light shots. The effects of 45-degree, 90-degree, front, and glamour lighting, and their countless variations, occur naturally in available-light situations. With a trained eye, you can quickly recognize and make use of them.

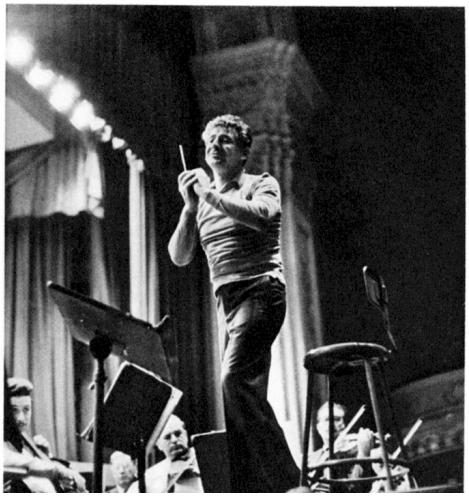
3 Moments of minimum motion: To take good pictures in available light, you must be able to hold your camera steady at slow shutter speeds. But even after you have learned this technique, there is still the problem that the subject may be in motion. Occasionally the blur of a moving subject will add to the interest of the picture, but usually a clear, sharp image is preferable. The only way to achieve this is to wait for a moment of minimum motion, when the subject can be captured sharply at a slow shutter speed. If you are shooting sporting events by available light, you can watch for the instant of peak action, when the movement seems to come to an almost complete halt.

As you saw demonstrated in an earlier lesson, a touch of motion blur in the right place can add a feeling of action to a picture. However, when a person's face is blurred, the effect usually is unpleasant. Therefore, don't shoot when the subject's head is in motion. And, of course, try to avoid photographing people just as they blink.

Waiting for the exact moment when the subject is properly separated from the background can make the difference between a good available-light photograph and a poor one. To make this shot of a commuter dashing for his evening train, Eisenstaedt chose a moment when the man was silhouetted against the light area of the car and window. The partial blur of the figure adds to the impression of motion. Thus, the slow shutter speed needed to get this dimly lighted picture actually contributed to its effectiveness. [Courtesy *Life* magazine, ©Time, Inc.]



In taking this candid, living-room picture of Italian screen actress Sophia Loren, Eisenstaedt waited not only for the precise moment when the subject had an animated expression, but also when her face was turned toward the light, so that we can see her features clearly. Because her face is tilted upward slightly, the shadows on it are not excessively large and dark–a common available-light fault. [Courtesy *Life* magazine, ©Time, Inc.]



In even the most violently active available-light situations there usually are moments when the action temporarily stops or slows down. Eisenstaedt was photographing a Leonard Bernstein rehearsal at Carnegie Hall when he made this picture. The dynamic conductor had paused an instant, enraptured by the music, when the photographer shot. The result is a sharp picture, even though it was taken at a relatively slow shutter speed. [Courtesy *Life* magazine, ©Time, Inc.]

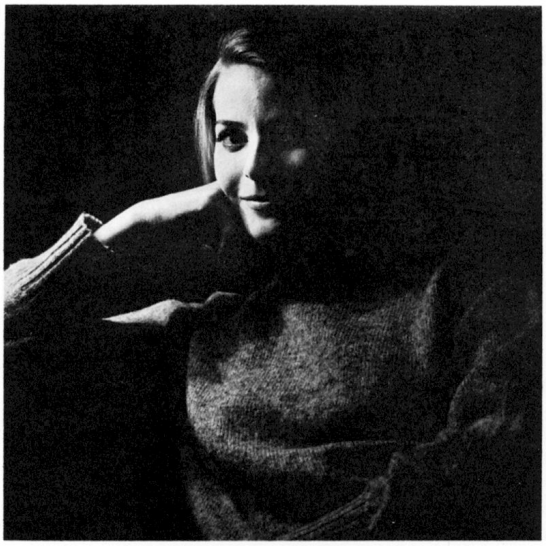
Common available-light faults and how to avoid them

Camera or subject movement

When the dimness of the available light makes it necessary to shoot at slow shutter speeds there is danger that the camera will move and the picture will turn out blurred, as happened here. In these situations, when you need a long exposure, it may be best to use a tripod. Many of your Faculty members make it a practice to carry a small one with them for just such an emergency. Another solution is to use a faster film. Sometimes the extra speed, permitting a faster shutter, is worth the sacrifice in grain and fine detail.

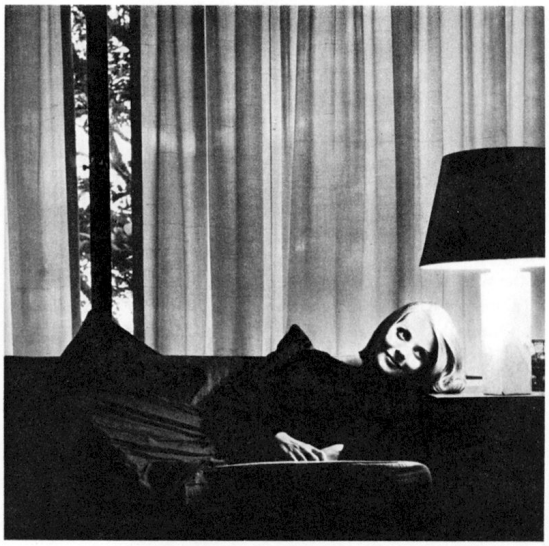
Blocked-up highlights

Overexposure can be as big a problem as underexposure. Here, to avoid underexposing the shadows, the photographer badly exposed the rest of the picture. The highlights were so blocked up that it was practically impossible to print them. If the girl had moved away from the lamp a little more, the intense, contrasty lighting could have been reduced–making it possible to use a compromise exposure. This might have produced a more usable negative in which printing could bring out adequate highlight detail.



Lack of shadow detail

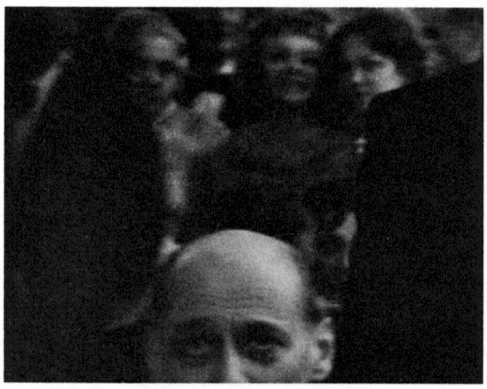
Available light can produce fascinating effects, as this portrait suggests. However, this picture is not totally successful, because one side of the girl's face is almost lost in the dark. If more detail had been captured in the deep shadows, possibly by using a slightly more generous exposure, the picture would be much better. Or a single reflector–even an open book or newspaper–might have been used to throw a little light into the shadows. Alternatively, the face shadows might have been held back during printing.



Multiple faults

This picture illustrates several common errors. The girl has been posed close to the lamp in extremely contrasty lighting. The highlights on her hair and face are greatly overexposed and the shadows very dark. She is wearing a dark costume and is posed against a dark background, so that the tones merge and it is hard to make out her body. The only area that is correctly exposed is the curtain, the least important part of the picture. The photographer might have posed the girl farther from the light to make the contrast less extreme. He could have opened the curtains and utilized the light from the window to produce more even lighting overall. Even in available-light shooting you often have some control–if not by moving the light source itself, then by moving your subject.

This portion of the picture contains high contrast. Compare the very bright highlights on Dietrich's left cheek and shoulder with the dark shadow under her hair and on the suit of the man behind her. Printing in was required because these highlights were so intense.



In this detail the contrast is quite low. The lighting is both dim and flat. The dark tones tend to merge, and the faces of the people in the background are hard to distinguish. This area had to be dodged to keep it from getting too dark.

A 'problem' available-light situation

Here is an Eisenstaedt photograph taken under typically difficult available-light conditions. It shows movie actress Marlene Dietrich and her escort arriving at Sherry's Bar at the Metropolitan Opera House. Dietrich is the center of interest, but there are many other things which help make this an unusual picture. Among these are the intensely curious faces in the background and the one of the man at the lower left, Rudolf Bing, general manager of the opera, who appears unaware of what is happening so near by. The problem was to produce a picture which showed all these elements effectively.

Eisenstaedt shot the picture when the star had moved into the light and was well separated from the wall behind her. Notice particularly Dietrich's relation to the light fixture and the painting behind her. If the photographer had shot a split-second earlier or later, her head would have fully overlapped one or the other of these and made a distracting composition.

This photograph is very contrasty in some areas and very flat in others, a characteristic of many available-light photographs. [Compare the two details at the left.] Eisenstaedt was shooting with high-speed film and a fast, wide-angle lens. He chose an exposure which would produce printable detail in the shadow areas that he considered important. As a result the lights on the rear wall and some of the highlights on Dietrich are considerably blocked up. This was partially corrected by printing in. Dodging was also necessary to hold detail in the faces of Bing and the star's escort.

Had Eisenstaedt based his exposure solely on the highlights on Dietrich, the shadow areas might have gone completely black, and the picture would be much less interesting. Thus, the situation called for the kind of intelligent compromise decision that you are often required to make. To do this successfully, you need experience and a thorough knowledge of how your chosen film-developer combination performs.

[Courtesy *Life* magazine, ©Time, Inc.]

Why you should master indoor lighting

As a photographer you are vitally concerned with light every time you take a picture–indoors or out. Light is not only the basic medium with which you record the highlights and shadows of your subject to reveal its form and texture, but it also is one of the basic tools you use to express your picture idea. Skillfully handled, it can give the picture mood and feeling, sharpen up the composition, and help it get the meaning across with greater clarity and impact. All the members of your Guiding Faculty agree that learning to see and use light is one of the single most important things that you can do to become a skilled photographer.

A good way to learn lighting is to see what you can do with it in a *completely controlled* situation. This is why practice in your own home studio with a few floods and a spot can be so valuable. Once you grasp the fundamentals of lighting and how its direction and quality can affect the appearance of objects and people here, you can apply this know-how to less controlled situations.

Even if you specialize in available-light photography, you should learn all you can about indoor lighting. As we have already indicated, the experience you gain working with floods, spots, and flash will enrich your understanding and point the way to the solution of the problems you encounter in available-light photography. Although the source of light may vary, and the working techniques of studio photographer and available-light photographer may differ, the fundamentals of good lighting remain constant.

It will help you to understand light and become skilled in using it if you observe it whenever and wherever you can. Notice precisely how it falls on an object, a person, an interior. Observe the direction and quality of the shadows and the intensity of the highlights. Ask yourself: If I were making a picture of this scene, would this light be working with me to achieve the effect I want, or would it be harming my picture? Would the addition of a fill-in light or an accent light make it work better? Would bouncelight soften this contrasty lighting–and should I bounce it off the wall or ceiling? Purposeful thinking along these lines–thinking about the different types of artificial illumination and available light and how you would use them in various situations–will strengthen your insight into the hows and whys of indoor photography. After you've worked with different lighting conditions for a time and taken enough photographs, an awareness of the light and what it is doing will become second nature to you. Light should be one of the things that you observe and evaluate automatically in your search for pictures.

Control over indoor lighting

To control the lighting in your indoor photographs, you can do one or more of the following:

1 Change the light itself: This includes your choice of a light source [flood, spot, electronic flash, etc.], how many units you use, how you arrange them in relation to your subject, and how far away from it you place them. Even when you work with available light you may have some control of this type. For example, you might change the position of a floor lamp, open a window curtain to let more light into the room, turn on an additional light, etc.

2 Change position of the subject or camera: In a controlled situation, arranging the subject–if the subject is a person, this means posing or directing him–is also an important way to achieve the lighting effect you want. In practice, of course, you are often likely to arrange both lights and subject, working back and forth until the lighting is right. However, if the light source is relatively fixed [as in many available-light situations] your main control may be one of position–that is, you change the lighting effect by changing the position of the subject in relation to this fixed light, or you change the position of your camera in relation to the subject. Sometimes even a slight tilt of a person's head, or moving your camera just a few inches one way or the other, can greatly improve the lighting effect.

3 Choose the moment when the lighting is right: For candid shooting by available light, when you are not directing or posing your subjects in any way, careful timing may provide the best chance for control. You must train yourself to wait, watch, and then shoot quickly when the light falls on your subject in the most effective way.

The uses of indoor lighting

It is vital that you begin to master these controls over indoor lighting at this stage in your growth as a photographer. Otherwise you will limit the scope of your photography. In many of the lessons to come, dealing with special subjects such as portrait, still-life, advertising, and fashion photography, you will need a basic knowledge of indoor lighting techniques. A large percentage of editorial and advertising photographs are shot with flash or floodlighting in a studio. If you hope to obtain and successfully carry out lucrative assignments in commercial photography it's essential to know a good deal about indoor lighting techniques.

On the other hand, if your interests lie more in press photography and photojournalism, you'll need a sound knowledge of flash and available-light techniques to cope with many of the situations you have to cover. In fact, skill in handling photographic lighting units is not only helpful but absolutely necessary in most types of photography.

We have given you much to learn in this very important lesson–so much that we don't expect you to absorb it all at once. It will take practice, time, and experience for you to acquire facility in handling flash, floods, and available light. However, you can speed up your learning process if you keep things simple as you practice. Work with one or two lights at first, until you thoroughly understand the effects you can produce with them. A mainlight and a fill, or a single lighting unit used for bouncelighting, can give you effective illumination in many situations. Concentrate on the fundamentals before you attempt the more elaborate, multiple lighting setups.

Also remember that lighting, although vital, is still only one of the many aspects of a good photograph. In forming your approach to lighting, consider this advice from Philippe Halsman, a past master at skilled and imaginative handling of indoor illumination:

"Producing lighting effects is not the aim of the good photographer. The control of all elements in a photograph should not be obvious, but invisible. The lighting should emphasize the mood and carry the theme of your picture, without drawing attention to itself. It is a tool, and the onlooker should admire only the work itself, and not the way the photographer used his tools."

Technical notes on the photographs

Page 2
Bert Stern; Nikon F with a 105-mm *f*/2.8 lens; Isopan Record film; 1/30 second at *f*/4; spotlight.

Page 2
Alfred Eisenstaedt; Leica with a 50-mm lens; Tri-X film; 1/50 second at *f*/8; available light.

Page 2
Philippe Halsman; Rolleiflex with a 75-mm *f*/3.5 lens; Super-XX film; exposure for electronic flash at *f*/11; electronic flash.

Page 2
Alfred Eisenstaedt; Leica with a 50-mm lens; Tri-X film; 1/25 second at *f*/4.5; available light.

Page 2
Richard Avedon; Rolleiflex with a 75-mm *f*/3.5 lens; Super-XX film; 1/60 second at *f*/8; floodlight.

Page 15
Philippe Halsman; Fairchild-Halsman with a 210-mm *f*/4.5 lens; Super Panchro-Press, Type B film; 1/10 second at *f*/11; floodlight.

Page 15
Philippe Halsman; Fairchild-Halsman with a 210-mm *f*/4.5 lens; Portrait Panchromatic film; 1/25 second at *f*/11; spotlight.

Page 16
Bert Stern; Hasselblad with an 80-mm *f*/2.8 lens; Tri-X film; 1/30 second at *f*/6.3; bare bulb.

Page 16
Arthur d'Arazien; 8x10 Deardorff with a 7-inch lens; Super Panchro-Press, Type B film; 1/25 second at *f*/11; 2 bounced floodlights.

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Ezra Stoller; 4x5 Sinar with a 90-mm lens; Super Panchro-Press, Type B film; 1/2 second at *f*/22; floodlight.

Page 17
Irving Penn; 8x10 Deardorff with a 12-inch lens; Super-XX film; 1 second at *f*/22; 4 floodlights.

Page 21
Arthur d'Arazien; 8x10 Deardorff with a 10-inch lens; Super Panchro-Press, Type B film; open flash at *f*/22; daylight and 30 flashbulbs.

Page 21
Philippe Halsman; Rolleiflex with a 75-mm *f*/3.5 lens; Super-XX film; exposure for electronic flash at *f*/11; electronic flash.

Page 26
Bert Stern; Rolleiflex with a 75-mm *f*/3.5 lens; Tri-X film; exposure for electronic flash at *f*/11; bounced electronic flash.

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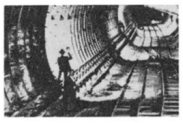
Philippe Halsman; Rolleiflex with a 75-mm *f*/3.5 lens; Super-XX film; exposure for electronic flash at *f*/16; electronic flash.

Page 27
Joseph Costa; 4x5 Speed Graphic with a 6-inch lens; Super Panchro-Press, Type B film; 1/200 second at *f*/11; flash on camera.



Page 28
Joseph Costa; 4x5 Speed Graphic with a 6-inch lens; Super Panchro-Press, Type B film; open flash at *f*/16; flashbulbs.

Page 29
Richard Beattie; Hasselblad with an 80-mm *f*/2.8 lens; Tri-X film; exposure for electronic flash at *f*/11; electronic flash.

Page 29
Philippe Halsman; Rolleiflex with a 75-mm *f*/3.5 lens; Tri-X film; exposure for electronic flash at *f*/22; electronic flash.

Page 31
Richard Avedon; Rolleiflex with a 75-mm *f*/3.5 lens; Super-XX film; 1/2 second at *f*/5.6; available light from street lamps and automobile headlights.

Page 31
Alfred Eisenstaedt; Leica with a 50-mm lens; Tri-X film; 1/50 second at *f*/8; available window light.

Page 31
Alfred Eisenstaedt; Leica with a 105-mm lens; Tri-X film; 1/50 second at *f*/5.6; available stage light.

Page 31
Irving Penn; Rolleiflex with a 75-mm *f*/3.5 lens; Super-XX film; 1 second at *f*/16; available window light.

Page 34
Alfred Eisenstaedt; Leica with a 35-mm *f*/2 lens; Tri-X film [pushed to ASA 600]; 1/15 second at *f*/2; available light.

Page 34
Alfred Eisenstaedt; Leica with a 50-mm lens; Tri-X film; 1/100 second at *f*/3.5; available light.

Page 34
Alfred Eisenstaedt; Leica with a 50-mm *f*/1.4 lens; Tri-X film; 1/30 second at *f*/2; available light.

Page 36
Alfred Eisenstaedt; Leica with a 35-mm lens; Super-XX film; 1/25 second at *f*/2.8; available light.